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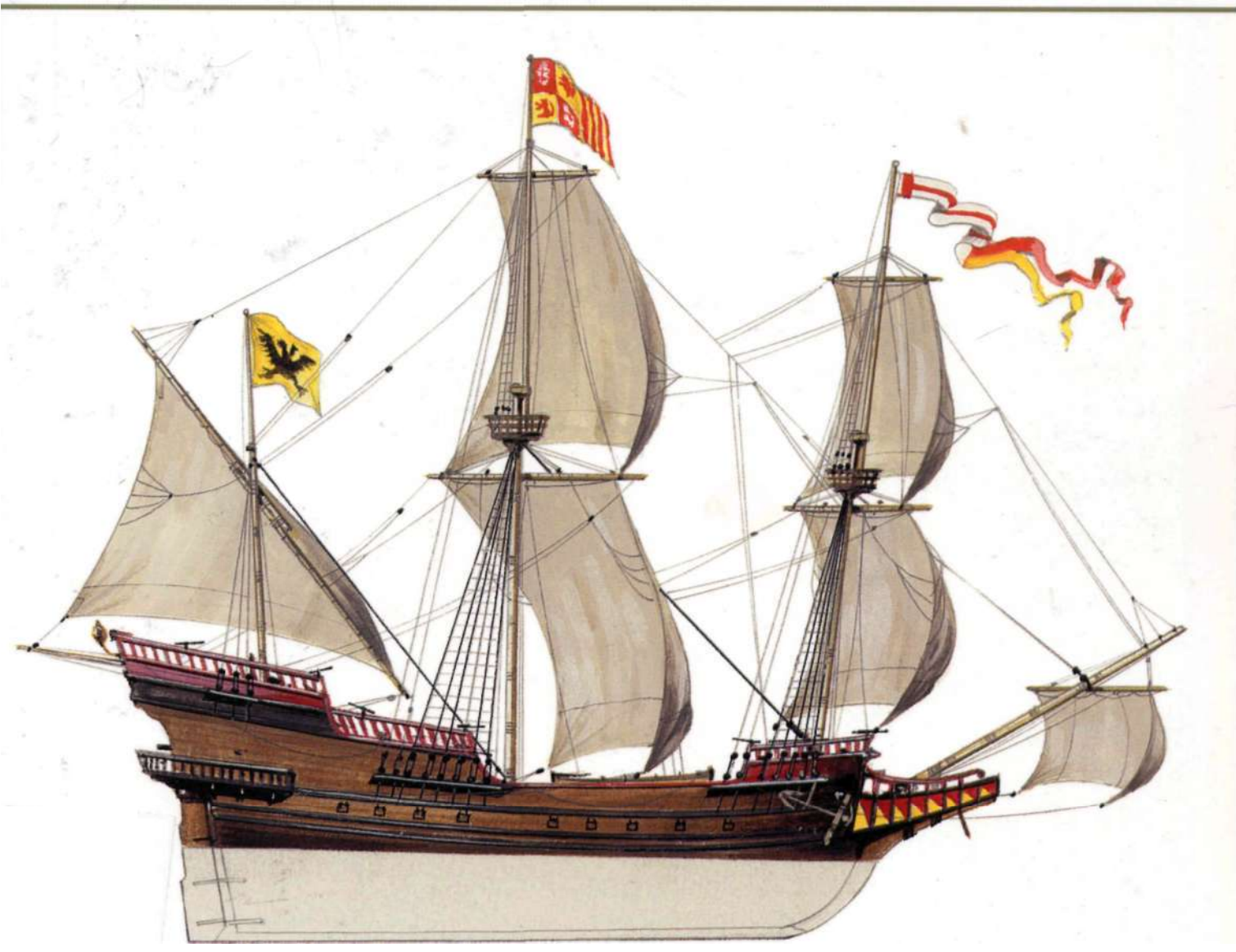
Spanish Galleon 1530-1690



Angus Konstam • Illustrated by Tony Bryan

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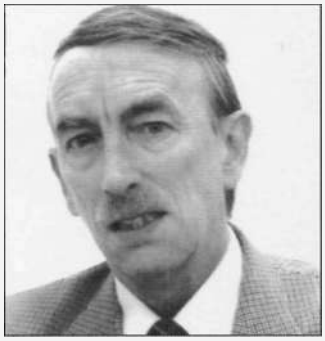

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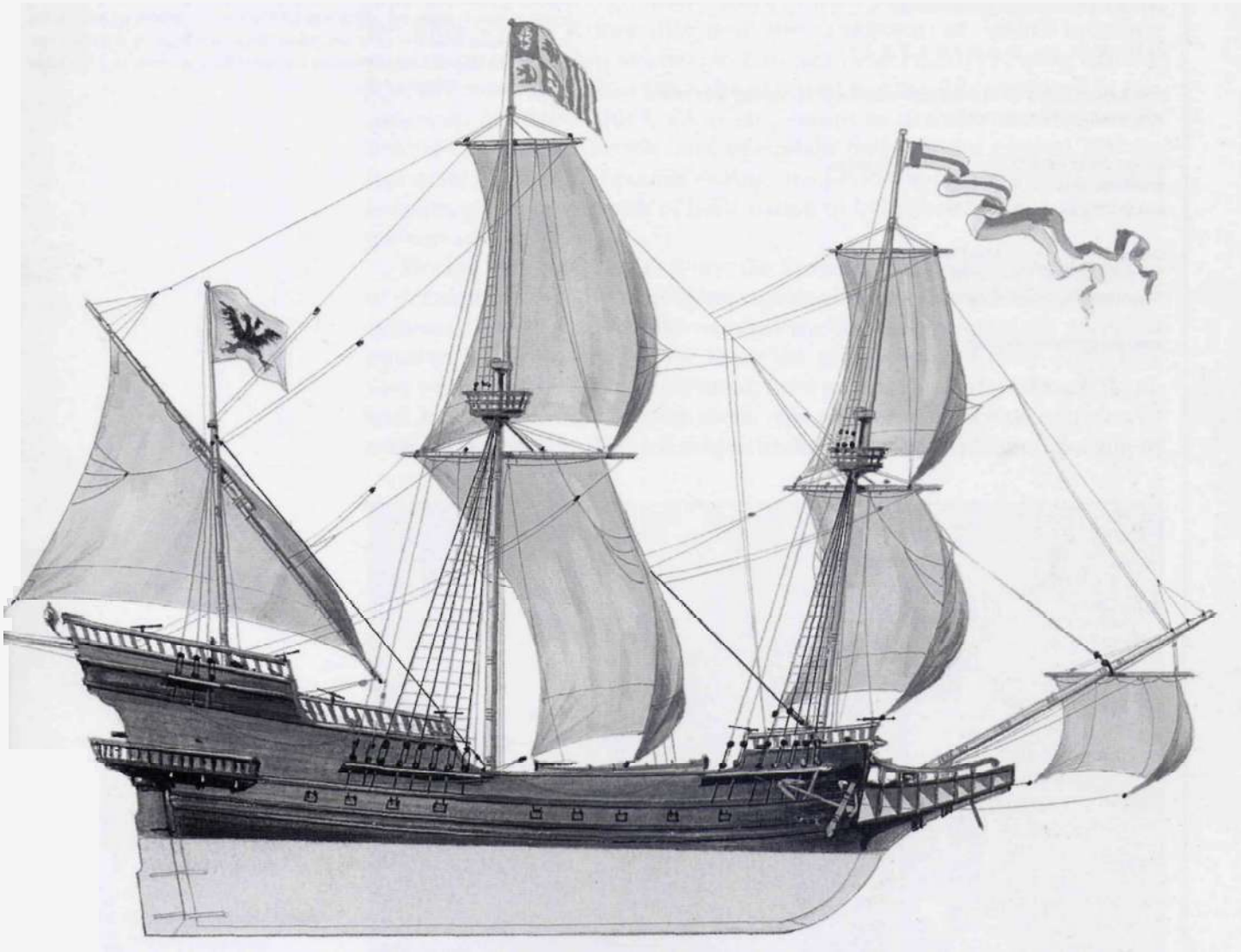

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Note on measurements

The following contemporary Spanish measurements were in use during this period:

Azumbre: Liquid measurement, equivalent to 4 pints
Codo: Linear measurement, equivalent to 56.5cm (22.2in)
Braza: Linear measurement, equivalent to 1.67m (5.48ft)
Libra: A Castilian pound, equivalent to 460 grams (16.2oz)
Quintal: 100 Castilian pounds
Tonelada: Measurement of a ship's carrying capacity, equivalent to 6.4 cubic *codos.* In weight terms this equated to 1,375 *libras* of displaced water. In some areas the older *tonel* was used, which was 20 per cent larger. In 1590 the tonel became the standard *tonelada,* which was set at 8 cubic codos, or 1,720 libras; the same as the French *tonneau.*

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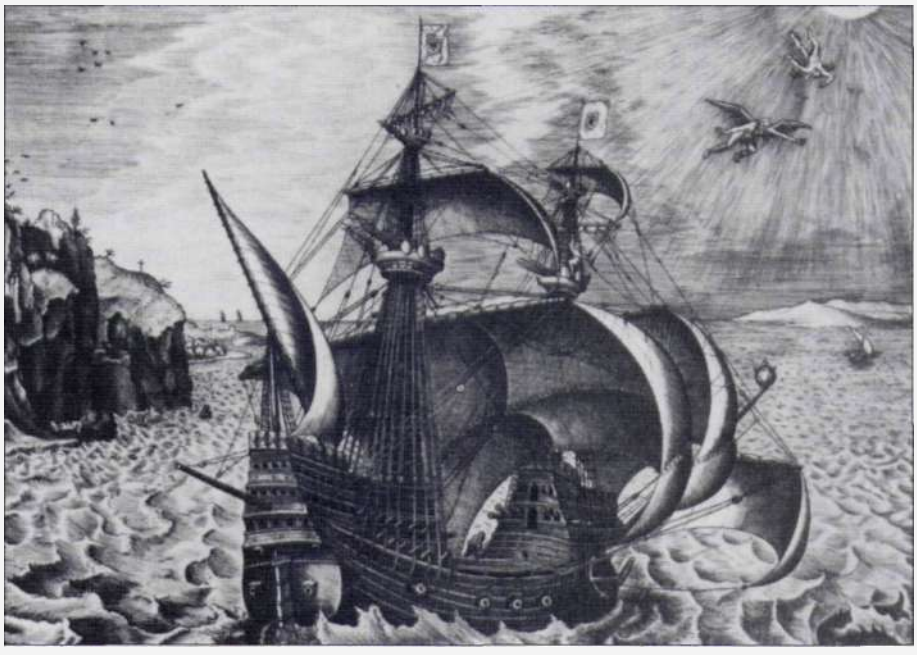
SPANISH GALLEON 1530-1690

INTRODUCTION

The Spanish Galleon is one of the most romantic ship types in history. Long associated with sunken treasure, pirates, conquistadores and the Spanish Armada, these ships have come to epitomise Spanish maritime power during the 16th and 17th centuries. Hollywood has much to answer for, and although these galleons were spectacular vessels, they were nothing like the grandiose ships of the Spanish crown portrayed on the silver screen. Rather they were the workhorses of Spain's maritime empire, protecting her interests in European waters, and ensuring that the Spanish crown benefited from the extraordinary wealth produced in her American colonies. This book is an attempt to describe the real vessels behind the popular facade, and to explain how they functioned. We are fortunate in that the Spanish during this period were meticulous record keepers, giving us a wealth of information to help us define exactly what a galleon was.

During the early 17th century, the Spanish government issued a series of detailed instructions, specifying exactly what they meant by a *galeon* (or 'galleon'; for simplicity's sake we shall use the more commonly accepted modern English spelling). We know the proportions of these craft, how they were fitted out and provisioned, what guns were carried aboard them, and how many men crewed them. We also have a wealth of pictorial evidence to support this rich source of documentary evidence, allowing us



This engraving of a mid-16th century carrack by Peter Bruegel the Elder (c. 1525-69) shows how these vessels were precursors of the galleons. Apart from the galleon's improved sail plan and greatly reduced forecastle, the basic design was the same. (Stratford Archive, London)

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to understand fully how these ships were built, sailed and fought during the period. Unfortunately due to the popularity of galleon shipwrecks with treasure hunters (as opposed to archaeologists), there is a less impressive caucus of underwater archaeological evidence to augment these other sources. This said, a number of highly publicised discoveries have been made, and these have revealed a wealth of information on the objects carried on board these vessels, even though little hard archaeological data was recovered.

These two vessels from a mid-16th century engraving demonstrate the transition from nao, carrack and carvel to galleon. The vessel on the left is a form of nao, but its forecastle has been reduced to improve its performance. The vessel on the right is another nao, but it is virtually identical to the first galleons, such as those of the 1554 Indies flota. (Stratford Archive, London)

The role of the galleon is almost as important as its physical description. Although its origins are obscure, it eventually became closely associated with the Indies, the Spanish term for their American colonies. Silver from Peru and Mexico, plus gold, emeralds and pearls from the northern coast of South America (known more romantically as 'The Spanish Main') became essential to the maintenance of Spain's position as a world power. The galleons made sure this treasure reached the royal coffers. Galleons also formed the spearhead of Spain's armadas which were sent to fight her kings' enemies in European waters. For over a century, these amazing ships dominated the waters of two continents. This is their story.

DESIGN

The development of the galleon

The origins of the galleon are somewhat obscure, but certainly the term first appeared during the early 16th century. It has been argued that the first Spanish vessel to merit the term was built in 1517 to fight Barbary pirates in the Mediterranean. This was probably a vessel that combined oars and sails, like the Venetian *galleoni* of the late 15th century. The Portuguese used similar small vessels they called *galleones* in the Indian Ocean during the 1520s, where they functioned as patrol vessels; 21 such craft were listed in an inventory dated 1525. A Spanish document dated the following year records royal *galeones* in the Spanish fleet, but no further details are given. The term was evidently recognised by the 1530s, when French sources refer to *galeons* as being Spanish warships, while the first visual depictions of the ship type also begin to appear. By this period galleons were no longer considered oared vessels, although Spanish galleons were being built to accommodate secondary sweeps (oars) as well as sails as late as the 1560s. These galleons were sailing ships, with a distinctive appearance which set them apart from contemporary carracks.

The early 16th century was a time of maritime innovation. Designers were experimenting with the best way to employ artillery on board ships, and new sailing rigs were being introduced. In the Mediterranean, the carvel was a small, light, lateen-rigged trading vessel. Two such vessels accompanied the larger carrack *Santa Maria,* Columbus' flagship, on its transatlantic voyage of discovery in 1492; the carvel soon became the most

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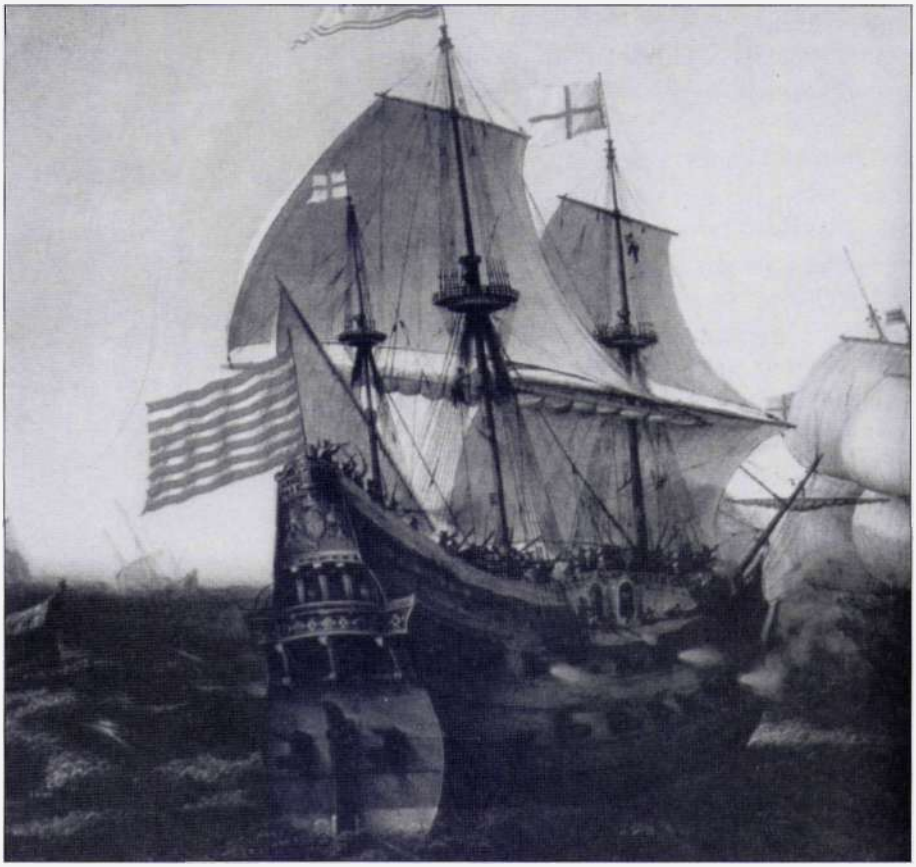

A Spanish galleon, most probably the *San Martin,* in action off Gravelines during the Armada campaign of 1588. Note the fighting positions in her foremast and mainmast tops. Detail of an oil painting by Hendrik Cornelisz. Vroom. (Tiroler Landesmuseum Ferdinandeum, Innsbruck)

commonly used vessel of exploration. In northern Europe, immense armed carracks were being built as symbols of national power; the *Henry Grace a Dieu* in England or the *Great Michael* of Scotland are prime examples. Larger and more cumbersome, the carrack (known as a nao in the Mediterranean and Iberian peninsula) was more closely related to the cog of medieval northern Europe, but it used a Mediterranean-style lateen-rigged sail on its mainmast, and a northern-style square-rigged sail on its foremast. The other difference between the nao and the carrack was that the former tended to be 'carvel built', with planks laid alongside each other on the outer hull, while the northern European carracks used 'clinker-built' construction, where the planks overlapped. Until the arrival of the galleon the nao and carvel remained the most common ship types in Spanish waters.

It has been argued that the first galleons were developed from the carvel, as both ships share similar features, such as a low forecastle (at least when compared to the nao or carrack), and the first galleons appear to have been relatively small vessels. In fact pictorial evidence shows that galleons and naos of the mid-16th century also shared similar features, such as strength of construction and their sailing rig. It is probably better to see the galleon as a product of an amalgam of Mediterranean ship-building styles and traditions; a vessel created to fill a gap in the range of available ship types.

By the late 1530s the galleon had come into its own. During the Battle of Prevesa (1538), a Venetian vessel described as a galleon fought off several Turkish galleys, demonstrating that vessels of this type were well armed, and obviously able to defend themselves. This was clearly a stronger

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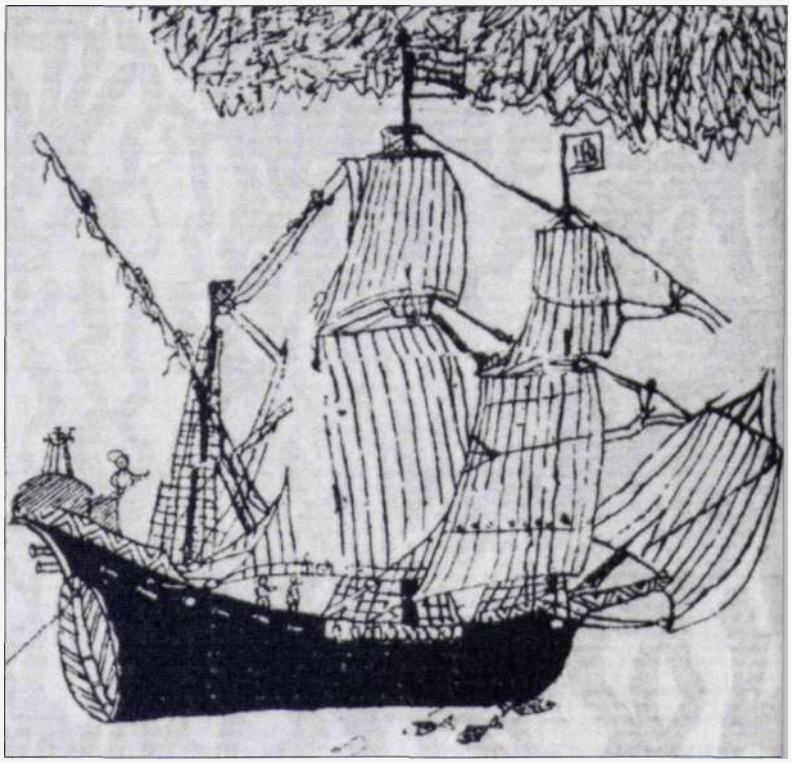
vessel than other Mediterranean sailing craft, as naos were not designed to withstand a heavy pounding from enemy fire. Rather they were commodious merchant vessels, though they could be armed with ordnance and filled with troops in time of war. Clearly galleons took this a step further, and were built as warships from the keel up. In a period when specialised warships were rare, the galleon was in a class of its own.

By the time of the accession of King Philip II of Spain (reigned 1556-98), the Spanish government had been running a convoy system between Spain and the New World for three decades. Initially these convoys were escorted by a single armed nao, but in 1536 the term galleon appears and, from that point on, small galleons were the escort vessel of choice. They also appeared in increasing numbers, as the growth of European interlopers in Spanish American waters led to an increase in the protection afforded to these Indies convoys. Ordinances of 1536 and 1543 stipulate how these ships should be armed, and what their roles were. Investigations of the wreck of the galleon *San Estebdn,* lost off the coast of modern-day Texas in 1554, have provided us with hard evidence concerning ship construction and provision, while the survival of a growing number of pictorial references attests to the development of this new ship type.



In this detail of a late 16th-century chart showing San Juan, Puerto Rico, the artist has added a crude but readily identifiable sketch of a Spanish galleon. Note the characteristic high sterncastle, low forecastle and well-provided full sail plan. (Archivo General de Indias, Seville)

During the decade before Philip II's reign, galleons were generally smaller than naos; some listed galleons had an average burden of just 120 *toneladas* (Spanish tons). This ties in with the near-contemporary description of them being capable of operating under oar power as well as sail. Larger vessels would have been extremely difficult to move using 'sweeps'. Naturally the use of oars was confined to coastal waters, the Mediterranean, or completely calm ocean conditions. By 1556 galleons listed in royal inventories had an average burden of 334 toneladas, or almost three times that of galleons of a decade before. Similarly, galleons sent to Flanders in 1558 had an average burden of 367 toneladas. The size of the typical galleon was clearly increasing. One confusing element is the Spanish bureaucratic tendency to refer to any armed vessel of this period as a galleon, but with some effort the armed naos can be isolated from the growing number of galleons.

The term was also being adopted by other maritime powers. Henry VIII of England's navy boasted a 'gallyon' in 1545 (a small patrol craft fitted with sweeps), and Portuguese, French and Flemish galleons are also noted in documents of the mid-16th century. Clearly the term was used generically to define a warship in Spain, and described a specific type of warship in Portugal and a vessel of similar proportions and appearance to these Iberian vessels elsewhere in Europe.

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A heavily armed nao forms the centrepiece of this portion of the tapestry depicting the Spanish capture of Tunis in 1535. As the work was probably commissioned two decades after the event, the vessel is actually a precursor of the galleon, as its forecastle is markedly lower than that of vessels which were built earlier in the century. (Reales Alcazares, Seville)

Through a combination of pictorial evidence, ship models, archaeological data and historical records, we can determine exacdy what a galleon of the mid-16th century looked like. Typically it was a high-sided vessel with a very tall sterncasde structure (usually split into two or more levels), a lower forecastle, a flat stern, a protruding beak at the bow (like the spur on a galley), and usually a single unbroken gundeck. The hull had a pronounced tumble-home (hull sides sloping inward from bottom to top), and this tapering continued into the sterncastie. A galleon's lines were graceful, and particularly fine at the stern, in contrast to its somewhat bluff bow. We know that galleons of this period were sleeker than naos; having a length-to-beam ratio of 4:1, as opposed to the average nao ratio of 3:1. We have already determined that the average galleon of c. 1550 had a burden of some 300 toneladas. Its hull shape made it a stable platform for artillery, while the high sterncastie proved a bonus in close-range fighting, as it served as a bastion for the embarked soldiers. Beneath the gundeck there was a decently proportioned hold, while the high superstructure provided room for the carrying of passengers or extra troops.

The typical galleon had a bowsprit, a foremast, a mainmast and a mizzen mast, and favoured a largely square-rigged sail plan. The largest galleons (of over 800 toneladas burden) often carried a second mizzen mast aft of the first, called a bonaventure mizzen. The bowsprit carried a square spritsail, while the foremast and mainmast both carried three square sails (main, topsail and royal). The mizzen carried a lateen sail, as did the bonaventure if one was fitted. Although styles changed, these basic characteristics continued to define the Spanish galleon until the mid-17th century.

The biggest change over time was in size. By 1570 galleons of 500 tons were commonplace, and by the time of the Spanish Armada in 1588, the crown was able to commandeer three 'great' Portuguese galleons of around 1,000 toneladas burden, as well as eight of approximately 800 toneladas.

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Despite purporting to be a vessel from the Barbary coast, this vessel is clearly a small Spanish galleon. Her appearance is typical of the 400- or 500-tonelada galleons which made up the bulk of the escort vessels assigned to guard the Indies flotas during the early 17th century. *An Algerine ship off a Barbary Port;* oil painting by Andries van Eertvelt. (National Maritime Museum, Greenwich, London)

After 1588 a combination of naval re-appraisal and a growing shipbuilding crisis in northern Spain led to a general decrease in galleon size, and vessels of around 500 toneladas burden became the most common until the end of the 'galleon era' in the mid-17th century. This was also linked to changes in the way specie was shipped from the New World to Spain. Increasingly, the king's share of the specie cargo was shipped in the convoy's escort galleons rather than in merchant ships, as this arrangement gave the Spanish administrators a tighter control over the import of valuable goods from the Americas. When King Philip III (reigned 1598-1621) acceded to the throne he stipulated that all New World specie was to be shipped in his royal galleons, on pain of imprisonment and heavy financial penalty. This royal share amounted to 20 per cent of all specie production in the Americas, plus 20 per cent of all private wealth shipped home. As the King also enforced a monopoly of transatlantic shipment, this was an extremely lucrative enterprise. Apart from a quantity of pearls and emeralds, some 80 per cent of the specie shipped in the annual convoys was silver, the remaining fifth being gold. Of the silver, most was shipped in the form of

A rare and important mid-16th century votive model of a Spanish galleon in the *Sanctuario de Nuestra Senora de Consolacion* in the Andalucian town of Utrera provides a valuable insight into ship construction and appearance. The model shown here is a copy of the original. (Museo Naval, Madrid)

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During the Spanish Armada campaign of 1588, the toughest engagement was fought off the port of Gravelines, when the Spanish fleet was scattered by fireships, then attacked by the English. The Spanish galleons and armed merchantmen were badly battered during the close-range fighting, but the fleet managed to regroup and break off the engagement. (Stratford Archive)

large ingots, but some 20 per cent was shipped as coins. Gold coins were first minted in the Americas in 1622, so in the galleon era gold was almost exclusively shipped in the form of 'finger-shaped' and hand-sized bars. This was all stored in the hold of the royal galleons. This led to a minor divergence of design, as galleons built as treasure carriers tended to be smaller and less well armed than their counterparts who patrolled the waters of Europe. This was also influenced by the dearth of European interlopers in the waters of the Spanish Americas between 1595 and 1620.

While the English designed 'race-built' galleons (sleeker versions of their Spanish counterparts), the Spanish were slow to adapt to changes in European ship design. By the start of the 17th century there was a general European trend towards a reduction in the size of sterncasde structures, but the Spanish continued to build galleons with towering sterncasdes until well into the 1630s, if not later. This may have been linked to the continued Spanish emphasis on the use of embarked infantry on board galleons. Superb maritime paintings dating from the early to mid-17th century show that the design of Spanish galleons hardly changed during this period, while the Dutch and English 'galleons' slowly evolved into a new type of warship: the ship-of-the-line. It was not until 1648 that Spanish shipbuilders began to copy these northern European designs and, in so doing, they brought the era of the galleon to a close.

Shipbuilding

In the 16th century the Spanish had two main shipbuilding areas: the Basque coast of northern Spain from La Coruna to Santander, and the southern Andalucian coastline, with its busy ports of Cadiz and Seville. For various reasons the Mediterranean coast from Barcelona to Cartagena was not considered suitable for the construction of galleons, although the

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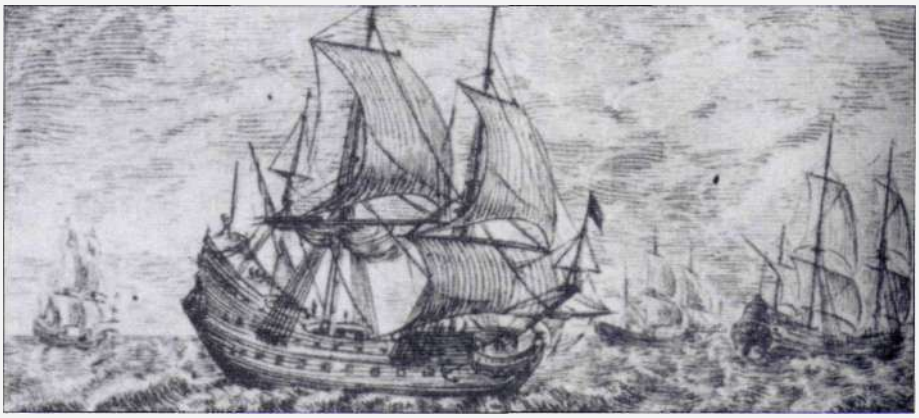

By the mid- to late 17th century, even the Spanish had begun to modify the designs of their ships in accordance with the latest theories on warship design. In this French engraving of a Spanish galleon, although the high galleon sterncastle is still in evidence, the remainder of her lines conform to those of Dutch French and English warships of the period. (Stratford Archive, London)

region was the primary source of galley production in the country. From 1580 onwards, the Spanish were able to build ships in Portugal, mainly in the mouth of the River Tagus near Lisbon. To a lesser extent the Spanish could draw upon the resources of other European ports, in Italy, Sicily and even Flanders, but these were rarely if ever used to produce warships, unless they were vessels that were purchased after completion by the Spanish crown. Finally, from around 1610 onwards, the Spanish were able to build galleons in the Caribbean. The biggest shipyard in the New World was in Havana, and Cuban shipwrights produced a string of galleons for use in the Indies convoys during the first half of the 17th century. The port of Cartagena on the Spanish Main also had a shipbuilding capacity, but for the most part its resources were used in the production of smaller patrol vessels, and the repair of visiting galleons and merchantmen. Of all these shipbuilding regions, the most highly regarded area was in northern Spain, in and around the port of Bilbao, although Havana was to become equally well regarded due to the Cubans' access to high-quality timber. Indeed, the supply of raw materials was vital, and Bilbao oak was considered superior to the oak of central and northern Germany, while the Basque region also boasted a thriving iron industry, and was a centre of artillery production. Another bonus was its strong maritime tradition, and its extensive trading links with northern Europe, ensuring a steady influx of long timbers such as pine for masts, and such materials as pitch, cordage and canvas. While most galleons were built from oak, those built in Havana were constructed using mahogany, which was superior.

Galleons were usually produced by private shipbuilders, who worked under contract for the Spanish government. Phillips (1986) cites the example of Martin de Arana, a Basque petty nobleman from Vizcaya who offered his shipbuilding services to the Spanish crown in 1625. By undertaking the work, he expected preferment for himself and his family, as King Philip IV (1621-65) pursued a policy of actively rewarding private shipbuilders and financial backers who offered to help the crown. This policy was a continuation of the course followed by the king's father, Philip III, during the first decades of the 17th century. Until then, after an abortive attempt to use royal shipyards, government officials had simply forced private shipbuilders to work in partnership with royal shipwrights, a policy which resulted in poor workmanship, lengthy production times and escalating costs. Most shipyards of the day were primitive, and construction was usually undertaken in the open air. In this period, the availability of skilled labour and materials was more important than elaborate facilities.

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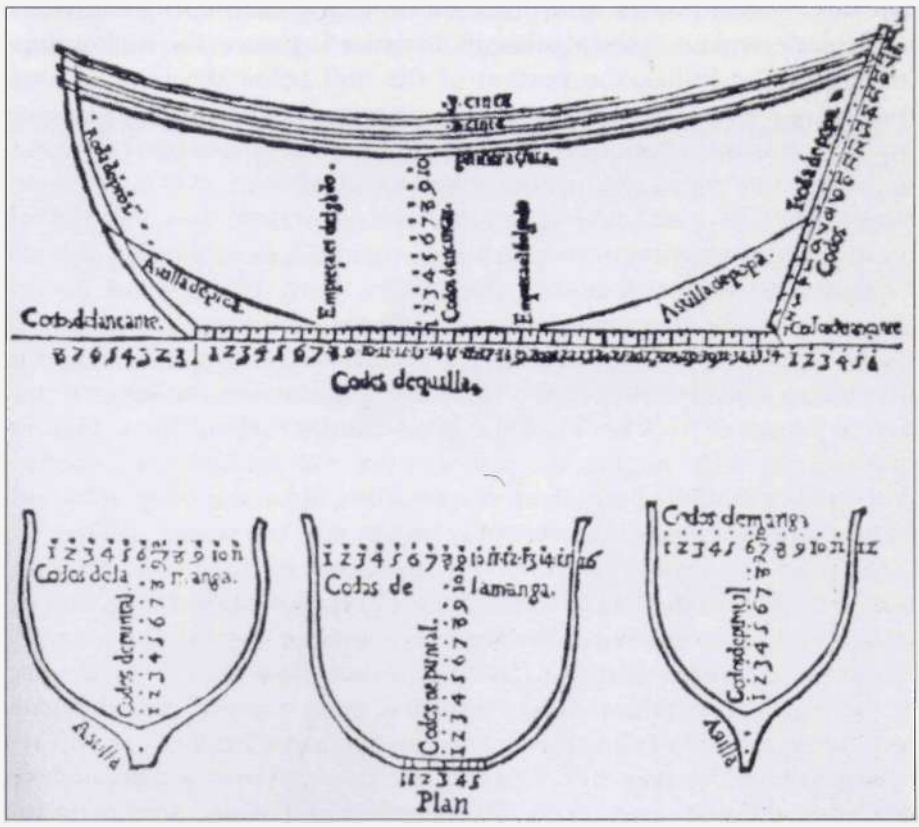
ABOVE **Although a generic engraving, this depiction of early 17th-century shipbuilders displays many of the tools and techniques which would have been available to Spanish shipwrights of the period. Like the vessel in the illustration, galleons were built in the open air. (Stratford Archive, London)**

Regulations governed almost every aspect of design, materials and construction, from the angle of slope of the sternpost to the way the dry provision store was planked. Apart from that, the process of shipbuilding was fairly straightforward. First, suitable timber was selected, usually from trees that had been cut during the winter. The *quilla* (keel) of the galleon was laid out on the ground (an area known as the *astillero),* its length determined by the size of the finished ship. Then the *roda* (stem) and *codaste* (stern) were added, each curving upwards from the keel at the prescribed angle in the government ordinances. Until the late 16th century, shipbuilding was usually a matter of good eye and judgement, but after 1580 designs had to follow a set of mathematical principles, and shipwrights had to measure everything. The key measurement in this was the *manga* (beam), as all other measurements were given in proportion to it. Next a series of *cuaderna* (ribs) were constructed, starting with the *cuaderna maestre* (major ribs) to create



The hull lines of a 400-tonelada vessel (with the proportions of a galleon or naoj were provided in Diego Garcia de Palacio's *Instruction nautica para navegar* of 1587, published the year before the Spanish Armada campaign. (Archivo General de Indias, Seville)

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the basic shape of the galleon below the *cintas* (gunwale). The shape of these varied considerably, from a 'U' shape amidships to a 'V at the stern, conforming to the elegant *garbo* (sheer) of the finished vessel. With the *cintas* in place, the shape of the hull was set. For a ship with a keel of 42 *codos*, 33 pairs of ribs would be used.

The vessel would then have its internal decks laid out, and these would be supported by knees. The *bodega* (hold) was usually kept free of internal decking between the *primera cubierta* (lower deck) and the decking built on top of the keel), although temporary mezzanine deck spaces could be inserted as required when the ship was in service. The mast steps were laid in place, then incorporated into the structure by creating supports around which the masts sat. Next came the planking of decks and the outer skins of the hull, using both wooden trenails and iron spikes. The use of iron spikes was faster, but less reliable, and the best hulls had a combination of both, giving both flexibility and linear rigidity to the timbers. On the *Nuestra Senora de Atocha*, built in Havana, the contractor just used iron spikes to save money, and consequently the hull was dangerously rigid. This led to litigation, where the crown sued the ship-builder for poor construction practices, a lawsuit which was still going on in 1622 when the galleon sank in a hurricane.

Most Spanish galleons used at least two main anchors, augmented by secondary anchors for added safety in dangerous waters. Several examples recovered from shipwrecks have bent shafts, suggesting that they lacked the robustness needed to save a galleon in difficulties. *Galleon at Anchor*; oil painting in the style of Andries van Eertvelt. (National Maritime Museum, Greenwich, London)

The thickness of the wooden planking increased towards the keel. The hull planks were then caulked using hemp fibres to make the hull as water-tight as possible. A layer of tar was then added to the seams to protect the caulking. Teredo worms and other timber-eating marine organisms are particularly virulent in the Caribbean. In order to protect the hull of ships bound for the Indies, the portion of the hull below the waterline was covered in a thin layer of lead sheeting, separated from the outer planking by a layer of tarred sailcloth. As a final precaution, the lower part of the hull was then coated with a mixture of tar and vegetable or animal fat. The masts were lowered in place, and once secured the riggers would set about laying the miles of supporting stays which kept them in place. Virtually the last element was the installation of the rudder, hung from pintles on the sternpost. Unlike later sailing ships, all galleons were steered using a *cana* (tiller), which moved the rudder by means of a *pinzote* (whipstaff), allowing the ship to be directed from the helmsman's position in the forward portion of the upper deck known as the *puente* (bridge). Then, apart from the finishing off of the rigging, the placement of internal bulkheads, ladders and capstans, and the hoisting up of spars, the galleon was complete. From start to finish the whole process would usually take two years.

Shipbuilders received payment for their work in three or four stages, usually made on signature of contract, on completion of the frame, and on completion. The number of lawsuits in the archives suggest that payment was rarely straightforward, as royal officials supervised virtually every stage of construction, and wanted to check that every element of the process met the government guidelines. Clearly there was extensive scope for corruption, and periodically monarchs or leading bureaucrats launched their own investigations and audits to make sure the government was

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not being cheated. During construction the shipbuilder had to pay for materials, for the high labour costs involved in hiring specialist workers, and for the lodging of government inspectors, and wait for reimbursement later. Clearly the whole process was worth it, as contracts were often issued to previous recipients; part of the preferment mentioned above.

The crown then received the ship, and was responsible for the outfitting of all other items not covered in the shipbuilding contract. This included the embarkation of ordnance, navigational instruments, lanterns, the ship's boat (which was usually towed astern, or else hoisted into the waist) and myriad other essentials. Then came the decoration of the vessel. It was usual to paint a portrait of the galleon's namesake on the flat face of the stern; this was usually a saint, the Virgin Mary or some other religiously inspired figure. Gilding was added to the poop cabins, the beak, the figurehead, and elsewhere when funds were available. Otherwise the interior of the ship was left unpainted, while the upper portions of the outer hull and superstructure were often painted in bands; these were predominantly black or ochre, but also bright yellow, red, blue and sometimes white. Flags were supplied for each mast, usually bearing the royal coat of arms, while additional flags were brought on board when the vessel was serving in a particular fleet, or to signify that a fleet commander was embarked. The last step was to provision the ship, a process which could take weeks, or even months. The galleon was then ready for use.

The nomenclature of the decks developed from the design of medieval castles rather than ships. The *bodega* (hold) and the *primera cubierta* (lower deck or gun deck) were shared with other Spanish ships such as naos and carvels. Behind the mainmast the sterncastle rose up in tiers. Collectively it was called the *tolda,* meaning 'awning', a reference to the makeshift protection of earlier ships. More commonly, the space was called the *alcazar* (fortress). At the top of the alcazar, the little cabin at the end of the poop deck was known as the *toldilla,* again signifying a temporary shelter

A small Spanish galleon of around 400 toneladas at the Battle of Fuengirola (1622), as depicted by an unknown artist. Interestingly, sharpshooters are shown stationed in the beakhead (in front of the forecastle), while her bow guns play on the enemy. (Museo Naval, Madrid)

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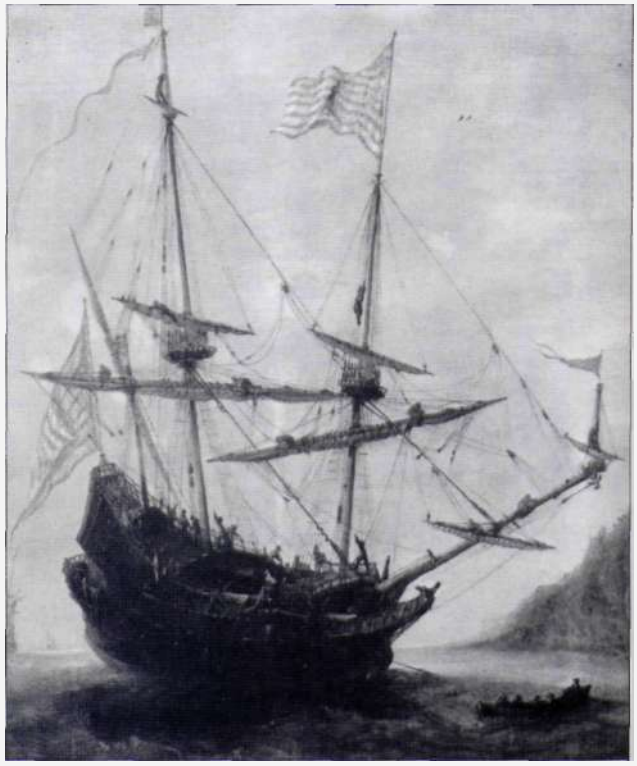
from the elements. The space beneath it as far as the waist was known as the *camarote*, this space provided the living quarters of the highest-ranking people on board. Further forward the forecastle was known as the *castillo* (castle). The terms alcazar and castillo are indicative of the way the Spanish viewed tactics, relying on their infantry to dominate the battle rather than their ordnance. Furthermore these high structures had a detrimental effect on the sailing qualities of the ship, making it hard to handle in certain winds, and prone to creep to leeward. This said, galleons were not the lumbering vessels they have often been portrayed as, and compared to most contemporary ships such as naos or carracks, they were nimble sailers. With their elegant lines, it could even be said that they were graceful vessels, and if their high stern structures did little else, it made them appear imposing, like floating bastions filled with the finest-trained musketeers of the day.



This representation of a typical small galleon of the early 17th century shows clearly the pronounced rake of the foremast and mainmast which was typical of vessels of this type. *The Santa Maria at anchor;* oil painting by Andries van Eertvelt. (National Maritime Museum, Greenwich, London)

Armament

The furnishing of ordnance for the galleons was the responsibility of the crown, which meant that royal administrators maintained meticulous records of guns, ammunition and artillery equipment. Even the captains of surviving ships from the Spanish Armada of 1588 were expected to produce detailed returns explaining just how much powder and shot they used during the campaign, and why. Legislation also laid down the regulation number and size of guns to be carried on royal galleons, and from 1552 this also laid down the manning ratios of ordnance, and their standard allocation of powder and shot.

The crown furnished its galleons with guns produced in royal foundries, and in most cases with powder and shot produced in royal workshops. It was not until 1633 that the crown permitted the production of powder by private Spanish contractors. Guns were allocated to a specific ship for the duration of a voyage, then on its return the ordnance and its related stores would be unloaded and returned to the royal warehouses. It was a cumbersome procedure, but it managed to make the best possible use of resources, and it usually resulted in the galleons having the guns they needed for a particular mission. Although there was a shortage of suitable ordnance in the late 16th century, the Spanish managed to procure guns from abroad, most notably from the foundries of northern Italy, Flanders and central Germany. During the early 17th century, a new Spanish gun foundry was created in Seville (1611) which produced bronze guns, while the foundry at Lierganes near Santander (1622) produced cast-iron pieces. By the 1630s, most Spanish ordnance came from these two centres.

The Spanish used several families of guns: *canones* (cannons), *culebrinas* (culverins), *pedreros* (stone-shotted guns), *bombardettas* (wrought-iron guns) and *versos* (swivel guns). Of these, the canones were large, stubby, heavy pieces, with a higher ratio of calibre to length than the more commonly

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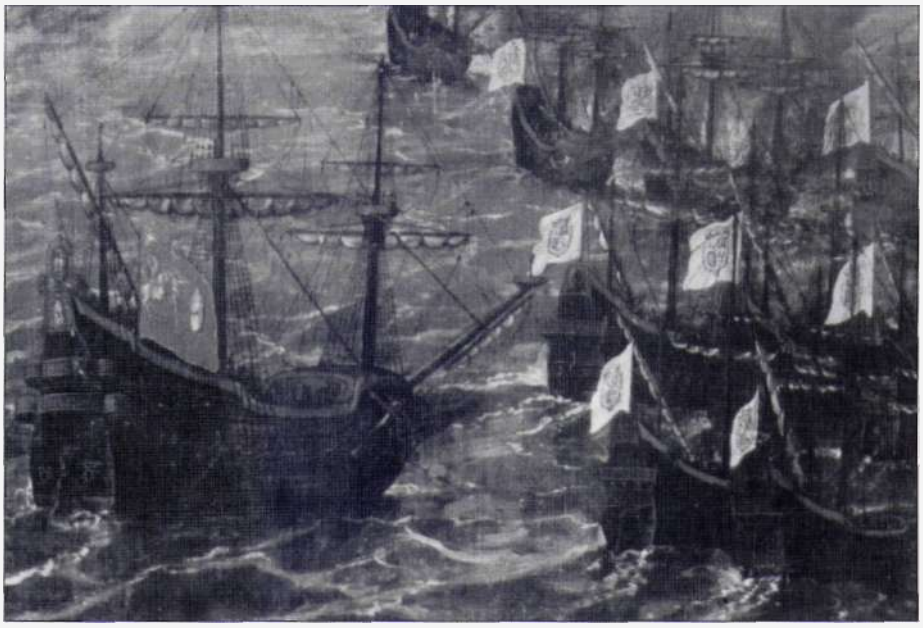
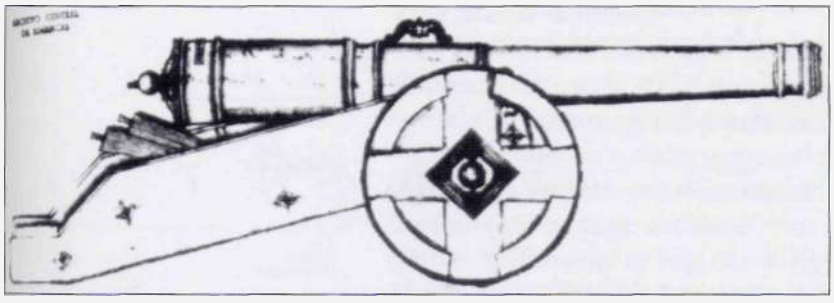


A Spanish galleon during an operation off Pernambuco in Brazil in 1635, from a detail of *Recapture of the island of San Martin;* oil painting by Juan de la Corte. The vessel is shown flying a royal standard from her mainmast, and a large red flag bearing St. George, the Crucifixion and the Ascension from the yard of her mizzen mast. (Museo Naval, Madrid)

used culebrinas. This latter group was subdivided into culebrinas and *medio culebrinas,* both of which were longer and lighter than canones or the even larger *canones de batir.* Pedreros were becoming increasingly rare during the later 16th and early 17th centuries, as the cost of producing specially shaped stone shot was becoming increasingly high. Short-range weapons, these pedreros were short-barrelled pieces, with a smaller powder chamber than bore. They were primarily seen as close-range anti-personnel weapons and, although still carried on galleons until the 1620s, they were no longer considered modern weapons. Bombardettas were the wrought-iron, breech-loading pieces which had first appeared on board Spanish vessels around 1400. Their range was considerably less than a similar-sized bronze gun, largely due to the leakage of gas from the breech (and therefore a loss of muzzle pressure) when the weapon was fired. They remained in use until the final years of the 16th century, but they last saw service on Spanish royal galleons in the 1570s. Most inventories of the 1580s and later referred to them as 'obsolete weapons'. The final group, the versos, were short-range anti-personnel guns, fired from swivel mounts attached to the ship's rail. These came in a range of types and sizes, but in general terms the verso fired a 1-pound ball, the longer and larger *verso doble* a $1^1/_2$-pound shot, and the largest of the group, the *esmeril,* fired a $2^1/_2$-pound projectile. All weapons of the verso family were breech-loading, meaning they could be reloaded extremely quickly when required. They could also fire either solid shot or anti-personnel grapeshot.



One of a series of Spanish sketches depicting gun carriages dated 1594, this drawing shows a typical two-wheeled Spanish naval carriage of the period. (Archivo General de Simancas)

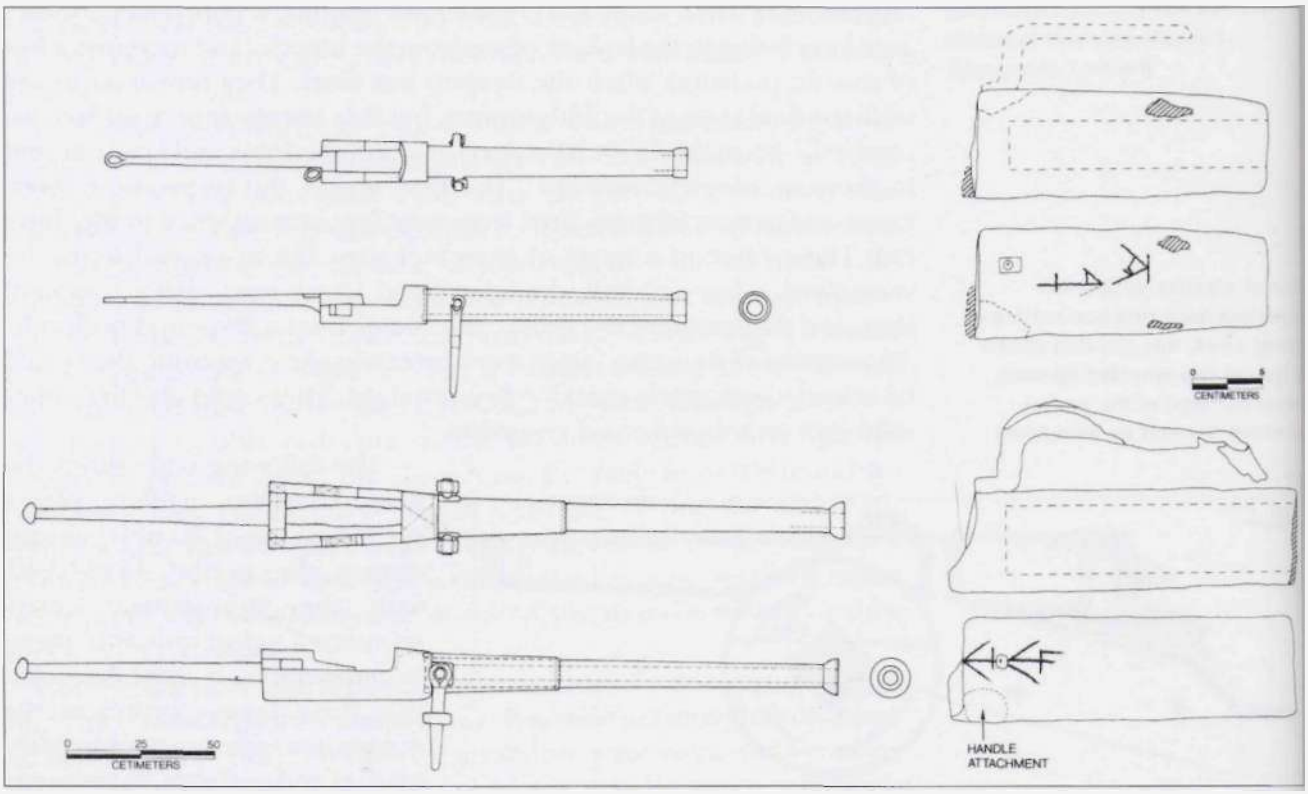
The following table shows the most common artillery pieces carried on board Spanish galleons during the period 1570-1640, with the approximate corresponding English ordnance name in parenthesis. It must be noted that these figures represent the *average* in a wide range of weights, calibres and gun sizes, as there was

little attempt at standardisation during the period. Each piece of ordnance was somewhat unique, and was even listed in the Spanish archives by its weight, as it was extremely rare for two pieces to weigh exacdy the same. To avoid confusion, while gun weight is given in *libras* (Spanish pounds), all other figures are presented in their English form.

AVERAGE GUN SIZES, 1570-1640

Gun type	Shot weight	Calibre (bore)	Gun weight (bronze)	Gun length
Canon (Demi-cannon)	24 libras	6in.	5,400 libras	11ft
Culebrina (Culverin)	16 libras	5 1/2in.	4,300 libras	12ft
Medio culebrina (Demi-culverin)	11 libras	4 1/2in.	3,000 libras	10ft
Sacre (Saker)	7 libras	3 1/2in.	2,000 libras	8ft
Medio sacre (Minion)	3 1/2 libras	2 1/2in.	1,400 libras	7ft

In most accounts of the Spanish Armada, the 22 galleons which participated in the enterprise are described as varying considerably in size and armament. Eight were between 500 and 600 toneladas and carried around 24 guns, eight more were larger 700-850-tonelada galleons carrying 30-40 guns, and three were enormous 1,000-tonelada vessels armed with approximately 50 guns apiece. In addition three smaller galleons of 250-350 toneladas were armed with 20-24 guns each. Like all vessels of the period, the total armament included all ordnance, from the largest canones to the verso dobles. However, it appears that, in most cases, versos were not



***Versos* (swivel guns) recovered from the wrecks of the 1554 Spanish Indies flota; three 'galleons' were lost off Padre Island, now part of Texas. Versos were used as anti-personnel weapons, mounted on the gunwales of both forecastle and sterncastle structures. (Texas A&M University)**

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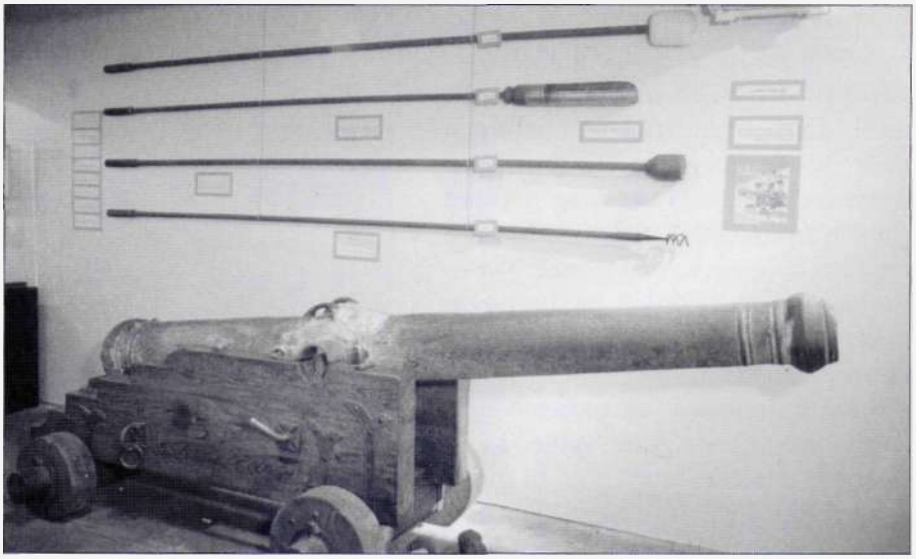

A bronze medio culebrina (demi-culverin) recovered from the wreck of the Spanish galleon *Santa Margarita,* which sank off the Florida Keys in 1622. The carriage is a poor reconstruction; the original would have been a two-wheeled affair. (Mel Fisher Maritime Museum, Key West, Florida)

counted, as they usually fired a ball smaller than a *falcon* (or *falconeta), the* equivalent of an English 'falconet', the smallest listed artillery piece of its day, firing a 1 or $1^1/_4$-pound shot. Discounting approximately a quarter of the pieces as being large swivel guns, this meant that a typical Spanish Armada galleon of 500 toneladas carried approximately 18 heavy guns, while a larger 750-tonelada galleon would have carried 24-30 large pieces.

These numbers are similar to the detailed accounts of early 17th-century galleons. The *Nuestra Senora de Atocha,* a 500-tonelada galleon built in 1618, carried 20 heavy guns: two canones, four culebrinas, ten medio culebrinas and four sacres. The largest pieces were carried as stern chasers, while the remainder were divided between the two broadsides, and carried on a single long gundeck. The culebrinas were carried amidships, the sacres forward of the mainmast, and the medio culebrinas towards the stern. All were mounted on two-wheeled carriages. In addition, 14 versos of var-ious sizes were carried, although it appears these were carried below decks or beneath the forecastle until required, when they were remounted on the two castles. Like almost all other galleons, the vessel was therefore well armed, but not overly so. As they also had to carry specie, passengers, and a company of soldiers, Spanish galleons of the late 16fh and early 17th centuries were adequately rather than generously provided with artillery, un like the sailing warships of the later 17th century, which were true ships-of-the4ine.

OPERATION

The *flota* system

The galleon was developed to fulfil a need; the protection and later the shipment of specie from the Spanish New World back to Seville. It later became the mainstay of Spanish naval efforts in European waters. In either capacity, galleons usually operated as part of *a flota* (fleet). During the first decades of Spanish colonisation in the New World, vessels usually made the transatlantic voyage on their own. By 1522, however, the shipowners of Seville had begun to beg the King for protection, and the result was the Indies flota system. An *averia* (shipowners' tax) was levied on goods

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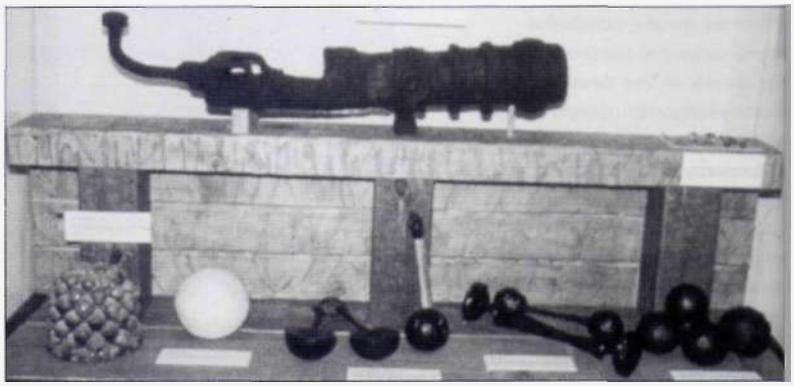
shipped across the Atlantic, and the money used to fund the building of warships to guard the transatlantic merchantmen. At first, merchantmen were escorted between Spain and the Azores, but in 1526 the King decreed that transatlantic shipping should travel in convoys, to make better use of the protection afforded by the escort vessels. From that point on, regular convoys sailed from Seville, bound for the Americas, each escorted by a single armed nao. While some ships still risked a solo voyage, increasing financial penalties made this an increasingly unpopular option.



This crude wrought-iron verso swivel gun recovered from the site of the *Nuestra Senora de Atocha* may not have come from the galleon itself. Records indicate that, after the disaster, survivors from the fleet marked the location of the shipwreck by attaching a marker buoy and chain to an obsolete verso, and dropping it over the wreck. This verso was recovered in 1985, complete with a chain wrapped around it. Beneath it a selection of shot for the larger guns carried on the galleon is shown, including bar shot, diced (canister) shot and regular roundshot. (Mel Fisher Maritime Museum, Key West, Florida)

Around 1555 the increasing risk of foreign attack led to increases in the averia to fund an escort of four naos or galleons per convoy. For the next century and beyond, a regular and highly organised (and regulated) transatlantic convoy system operated with two annual sailings from Seville to the New World. One sailed to the Tierra Firme (the Caribbean coast of South America), the other to New Spain (now Mexico). Usually the New Spain flota left Seville in April, and the Tierra Firme flota departed in August, both following a south-westerly route to the Canaries and across to the southern part of the Windward Islands. After collecting Mexican silver, oriental spices, porcelain and other goods, the New Spain flota wintered in Vera Cruz, then sailed to Havana the following summer. Similarly the Tierra Firme flota wintered in Cartagena after collecting the king's share of the annual Peruvian silver production from Porto Bello. It then sailed to Havana before heading back across the Atlantic. Usually, but not always, the two flotas returned separately, arriving back in Seville in October and November, after that fresh year's convoys had both sailed. The Spanish crown came to rely on the annual arrival of silver, gold and precious minerals, as the revenue produced was used to fund Spain's struggle for dominance in Europe.

The galleons that accompanied the flotas did not always follow the same route as the merchantmen. It was usual for the escorting galleons (known as the *Armada de la Guardia)* to leave the flota when it reached the Caribbean, then return from Havana with the previous year's flota. This meant that usually galleons did not have to winter in American waters. The flota itself was usually a merchant convoy. When accompanied by escort galleons, it became known as an *armada y flota*, or a *flota y galleones.* Distinctions became blurred during the 17th century, and the ships of the Tierra Firme flota eventually came to be referred to as galeones, as most escorting galleons accompanied this flota rather than the less valuable New Spain flota.

Galleons that formed the Armada de la Guardia were usually seconded from the Spanish home fleet, which from 1580 became known as the *Armada del Mar Oceano* (Atlantic Fleet). Formed around the galleons of the Squadron of Portugal (the main striking force of the Spanish fleet), the Armada del Mar Oceano evolved into a permanent navy during the late 16th and early 17th centuries. Apart from its Portuguese core, it usually comprised three or more squadrons, based in Seville and Cadiz, La Coruna and Santander, and in Lisbon. The armada consisted of both royal

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In another detail of the Pemambuco painting, the Spanish flagship of Don Lope de Hoces is shown at anchor, covering the landing of Spanish troops. Detail from *Recapture of the island of San Martin;* oil painting by Juan de la Corte. (Museo Naval, Madrid)

warships and vessels leased by the crown and, although the number of galleons in the armada was usually low, they became the main offensive core of the fleet. For instance, during the naval campaign of 1588, the Spanish Armada consisted of over 120 ships, of which only 20 were galleons (the rest being naos, armed merchantmen, galleasses and other smaller vessels). Although the number of galleons increased during the early 17th century, the fleet always contained a range of warships of various sizes. This meant that Spanish galleons operated in small groups as flota escorts (and later as specie carriers) in the Caribbean, and in powerful squadrons as part of a larger Spanish fleet in home waters. In addition, a specially created *galiflota* (galleon fleet) was occasionally detached from the Armada del Mar Oceano and sent to the Americas for a particular purpose, as happened in 1625 and 1629-30. A versatile warship, the galleon served wherever it was most needed as the arbiter of seapower on behalf of the Spanish crown, and the protector of Spain's maritime empire.

Shipboard organisation

For much of the period in which galleons formed the mainstay of the Spanish fleet, manpower was allocated to them according to an established quota. The basic rule was that one man was allocated to a galleon for every tonelada of burden, although this could be increased to $1^1/_2$ men per tonelada in time of war, or for a specific expedition. In practice, the manning of a galleon varied considerably, and financial considerations played a major part in reducing the size of the crew, often to less than half

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the 'one man per tonelada' ratio. In 1550 galleons and merchant ships sailing to the Indies carried only one *gente de mar* (mariner) per $5^1/_2$ toneladas, although the seamen were augmented by officers and soldiers. In 1629, a formula of one mariner per $6^1/_4$ toneladas, and one soldier per 4 toneladas was applied. Obviously, these numbers were increased in time of war and, in addition to carrying their assigned crews, galleons were often used to transport troops, either across the Ocean Sea (Adantic), or to the Spanish Netherlands, or when embarked for an amphibious operation. Figures from the records of the Armada de la Guardia in 1601 and 1613 show that, on average, galleons carried crews of approximately 90-100 men per vessel, excluding soldiers. While the proportions of seamen to landsmen, gunners or pages varied slighdy between the two dates (with the number of pages decreasing and trained seamen increasing), a broad notion of crew numbers can be obtained. A typical 500-tonelada galleon during the early 17th century carried approximately 15 officers, 26 seamen, 19 apprentice seamen, 10 pages and 21 gunners: 91 men, or one man per $5^1/_2$ toneladas. Using the formula given above, the same galleon would have a company of approximately 125 soldiers on board, giving a total complement of 216 men, not counting any supernumeraries, passengers, or embarked troops in transit. These figures reflect the individual records of Spanish galleon crews during this period, although it appears that the number of soldiers embarked on a ship of this size could vary by as much as 25 per cent, depending on need. However you look at it, the number of soldiers carried on board a Spanish galleon is strikingly high.

In the middle ground of this detail from a commemorative painting, Spanish galleons and galleys provide artillery support to Spanish infantry during an attempted English amphibious landing near Cadiz (1625). *The defence of Cadiz against the English;* oil painting by Francisco de Zurbaran (1598-1664). (Museo del Prado, Madrid)

Organisation within a fleet, or in individual ships, was clearly defined. Whether it was destined for the Indies, formed an independent fighting fleet, or was part of a larger armada, a galleon 'fleet' was commanded by a *capitan-general,* appointed by the king. Actually, the term 'squadron' is more appropriate, as most galleon fleets rarely consisted of more than a dozen vessels, not counting escorted merchantmen. In his *Itinerario* (1575), Juan Escalante describes the perfect capitan-general as: 'a very good man, of good family and well born, a native of Seville, a good Christian and experienced on the sea ... of a proper age, neither old, nor young.' Surprisingly, if not always met, most fleet commanders came close to this ideal. Men such as Don Fadrique de Toledo y Osorio, Don Juan de Benavides and Francisco de Mendoza were all products of the Spanish aristocracy, the chivalric military orders and the Spanish military machine. Skilled courtiers, diplomats, soldiers and mariners, these commanders held great responsibilities, but usually rose to the challenge. They embarked on the flagship of the squadron (known as the *capitana),* along with a small staff,

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which usually included royal officials as well as their own entourage. The fleet second-in-command was the *almirante* (admiral), an officer appointed by the capitan-general. He was responsible for the seaworthiness of the squadron, the maintenance of its sailing and battle formations, and all aspects of its maintenance, readiness and efficiency. By necessity the almirante was usually more of a seaman than a soldier. Traditionally, his flagship (known as the *almiranta)* took up position at the rear of the squadron, or on the opposite side of a formation from the capitana.

On board individual galleons, the senior officer was the *capitdn* (captain). During the 16th and 17th centuries, there were two different types of ship commander. The *capitdn de mar* (naval captain) was usually a professional seaman, but had no jurisdiction over the troops embarked on his ship, even though he might be the senior officer on board. These men were rare, and normally the capitan was a soldier (*capitan de guerra*), not a sailor, who relied on the master (whose role is described below) to operate the ship on his behalf. While other maritime powers favoured a sole commander on their vessels, the Spanish continued to rely on joint command well into the 17th century. Usually, a *capitdn de mar y guerra* was appointed to command, who in theory had jurisdiction over everyone on board his galleon, but usually had little or no experience in maritime affairs. While officers with suitable experience on both land and sea existed, the majority tended to be primarily infantry commanders, and their involvement in the maritime operation of their own ships was limited to bureaucratic rather than practical matters.

The *maestre* (master) was effectively the principal seaman on board, and while the duties of the capitan were largely administrative, his were practical. In effect, he commanded the ship, while his superior the capitan commanded the infantry. Juan Escalante described the ideal maestre as being: 'a skillful mariner ... [worthy] of credit and confidence.' He went on to liken the maestre to a queen bee in its hive. Unlike other officers,

Spanish galleons helped maintain Spanish naval power in the Mediterranean as well as the Atlantic and the Americas. In this oil painting, *An engagement with Corsairs* by Andries van Eervlet (1590-1652), a Spanish galleon is set upon by Barbary pirates. (National Maritime Museum, Greenwich, London)

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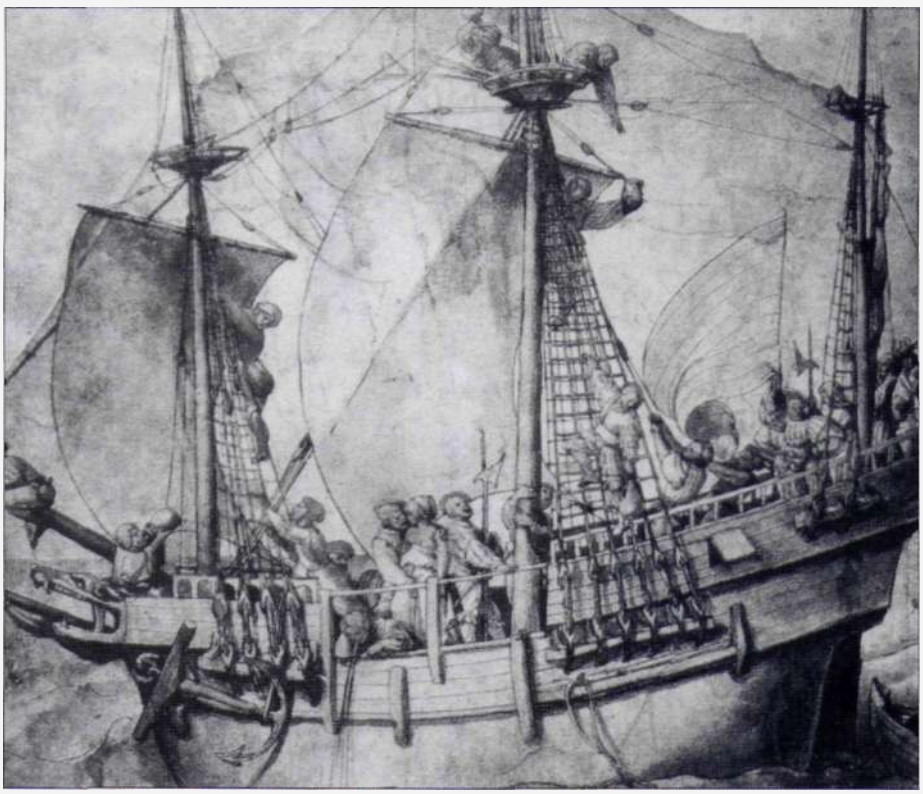
who were appointed for the duration of a voyage, the maestre usually remained with a particular ship for the duration of its active service. He was responsible for sailing his galleon, the supervision of its provisioning, and the maintenance of its timbers. As his role became increasingly administrative during the 17th century, many of his operational duties were taken over by an *alferez de mar* (naval first lieutenant). Next in the chain of command was the *piloto* (pilot), responsible for the safe navigation of the galleon. In a squadron, the *piloto mayor* (chief pilot) determined the course the squadron would set, while the individuals on each ship followed his lead. These men should not be confused with harbour or bar pilots, who were embarked in coastal or riverine waters, such as when transiting the Guadalquivir River between Seville and the sea. After the piloto, the next maritime officer in rank was the *contramaestre* (roughly equivalent to boatswain). As the principal assistant to the maestre, his duties involved the loading of the ship, operation and maintenance of the sails and rigging, and the smooth running of the ship. He was assisted by a *guardian* (boatswain's mate), who had the extra duty of supervising fire safety on board, such as the use of galley fires, candles or lanterns. Another assistant was the *despensero* (which roughly equates to chief steward). His responsibilities were the preservation and dispensing of the ship's provisions - food, wine and water - and their rationing in time of shortage. For the latter, a seaman was appointed as the *alguacil de agua* (water dispenser) to assist the despensero in his duties. The duties of the *codestable* (master gunner) are described below.

In addition to these officers, a typical galleon also carried a number of supernumerary officials, who played no part in the running of the ship. In *galeones de la plata* (silver, or treasure galleons) in the Indies flotas, chief of these was the *maestre de plata* (silver master), appointed by the *Casa de*



16th-century shipboard life as depicted by Hans Holbein the Younger (1497-1543). Sailors and seaborne soldiers pass the time by drinking, making advances to women passengers and skylarking in the rigging. In fact, discipline on Spanish galleons was surprisingly tight, and displays of religious fervour were more commonplace than scenes of debauchery. (Stadelsches Kunstinstitut, Frankfurt)

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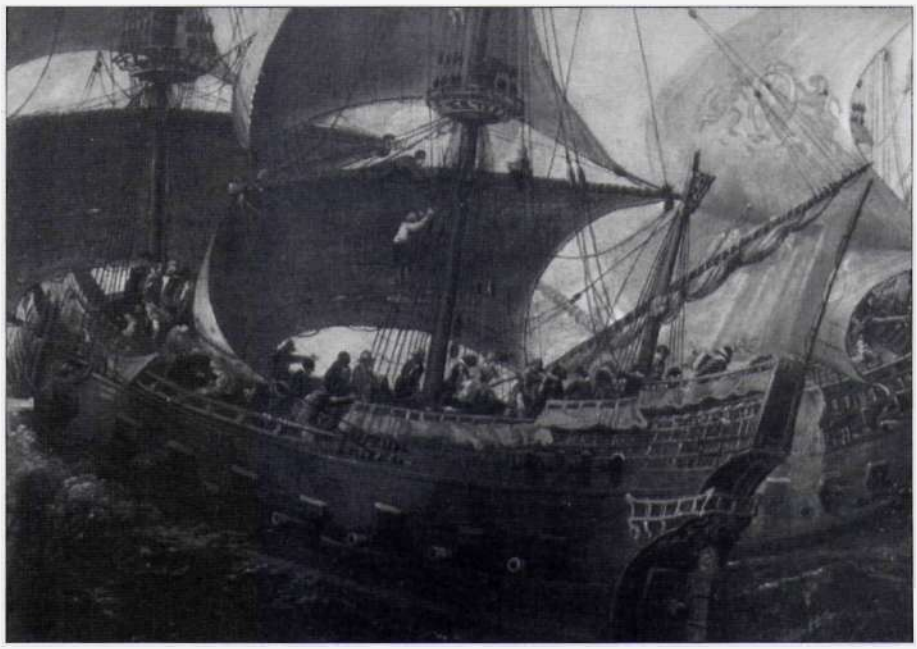
When the wreck of the *Nuestra Senora de Atocha* was discovered by treasure salvor Mel Fisher in 1985, her main cargo of silver ingots was still neatly stacked on the seabed, conforming to the lading pattern of her after hold in 1622. These 70-pound ingots have been restacked to conform to the way they were found. (Mel Fisher Maritime Museum, Key West, Florida)

Contratacion, the organisation which oversaw taxation and tribute in the Indies. He registered all specie carried on board, whether privately or government owned, and ensured that the appropriate taxes had been paid. He was assisted by a handful of *fiadores* (clerks), and while the maestre de plata himself embarked on the capitana, his assistants were dispersed throughout the flota as required. Another bureaucrat attached to the staff of the capitan-general was the *veedor* (inspector), who represented all aspects of the King's financial interests in the squadron, whether specie was carried or not. On each galleon, another crown appointment was the *escribano* (notary), who recorded all movement of cargo on board. The remaining supernumeraries on a galleon were the *capelldn* (chaplain), appointed by the capitan-general, and the *cirjano* (ship's surgeon), appointed by individual ship captains.

As for the crew, apart from a handful of specialists, the *gente de mar* (mariners) were divided into four groups: *marineros* (able seamen), *grumetes* (apprentice seamen or 'landsmen'), *pajes* (pages, or ship's boys) and *artilleros* (gunners). The specialists comprised the non-commissioned officers on board; they were collectively known as the *maestranza* (artificers), and usually included the ship's carpenter, a diver, a cooper, a caulker and one or more trumpeters. The artilleros regarded themselves as superior to other gente de mar, and under the watchful eye of the codestable they maintained the guns and operated the pieces in battle, each supervising a crew comprising non-specialist gente de mar. Marineros were usually skilled seamen as opposed to the grumetes, who were usually



Although purporting to be a Dutch ship, the artist has based his depiction of this vessel on a small Spanish galleon. While soldiers with small-arms fire from the waist and sterncastle, a trumpeter stationed on the poop relays the orders of the vessel's commander. Detail of a painting by an unknown artist depicting the Battle of Fuengirola (1622). (Museo Naval, Madrid)

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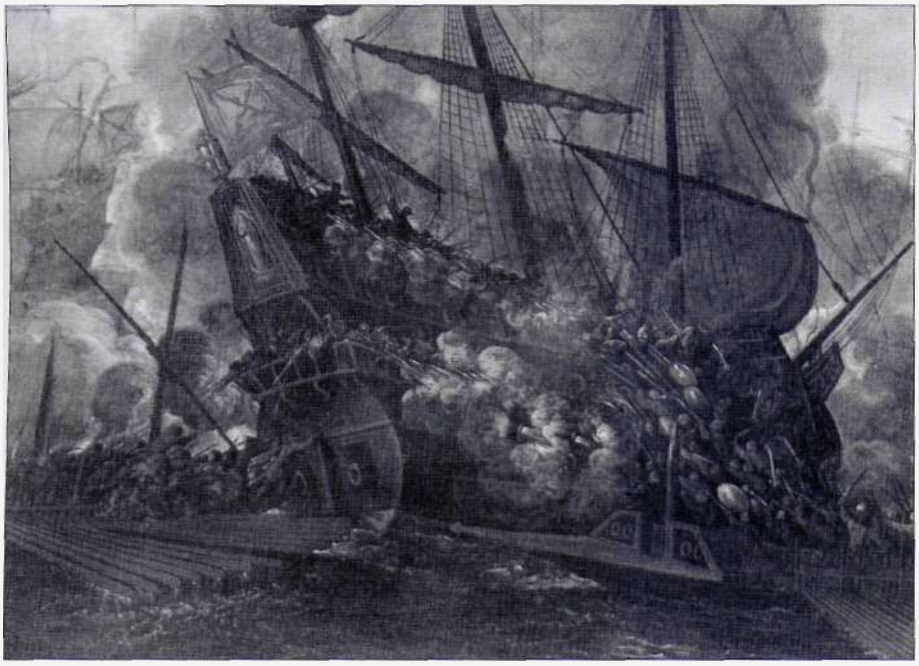
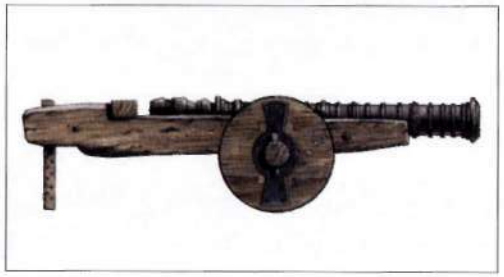


The soldiers on board a Spanish galleon repulse a boarding attack by Barbary pirates, in this detail of *Combat between Spaniards and Turks;* an oil painting by Juan de la Corte (1596-1660). Note the use of musketeers in the stern galleries, and the close-range use of artillery fire. (Museo Naval, Madrid)

teenage apprentice seamen, who learned their craft while at sea. The same division of skills can be found in most ships during the age of sail. At the bottom of the maritime hierarchy were the pajes, sometimes the relatives of serving officers or their friends, but more usually orphans or runaways. Aged 12-16, these youths performed all the menial duties, such as scrubbing decks, preparing meals or helping the seamen. The gente de mar were divided into two or sometimes three 'watches', set by the maestre, ensuring the ship could be sailed throughout the night. Mariners who were not on duty could be called upon to assist the watch on deck.

Finally, there were the soldiers, who formed their own organisation within the ship. All embarked troops in the squadron were commanded by the capitan-general, although he was assisted by a *gobernador* (military governor), who was usually a capitan of one of the non-flagship galleons (which was duly called the *gobierno).* On each galleon, the infantry were commanded either by their own capitan or by the ship's capitan de mar y guerra. In effect, each galleon carried a company of troops on board, and its organisation reflected contemporary Spanish practice on land. The capitan was assisted by an *alferez de guerra* (military lieutenant), who supervised discipline amongst the troops, and saw to their accommodation on board. As in almost any army, the lieutenant relied on the *sargento* (sergeant) to supervise the day-to-day activities of the men. The embarked company was divided into 'squadrons' of 25 men, equating to a modern infantry platoon. Each was commanded by a non-commissioned *cabo de escuadra* (squadron chief, or platoon commander). Like the seamen, the soldiers were divided according to experience, with *soldados aventanjados* (experienced soldiers) receiving greater pay. These included the *abanderado* (standard bearer), two *tambores* (drummers) and one *pifano* (fifer). In addition, *mosqueteros* (musketeers) and *arcubuceros* (arquebusiers) were paid more than other soldados. An examination of contemporary rolls has shown that 50 per cent of a typical company were soldados (armed with half-pikes or halberds), while the remainder were divided equally between mosqueteros and arcubuceros.

A: The *San Esteban,* 1554



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C: The *San Juan Bautista,* 1588

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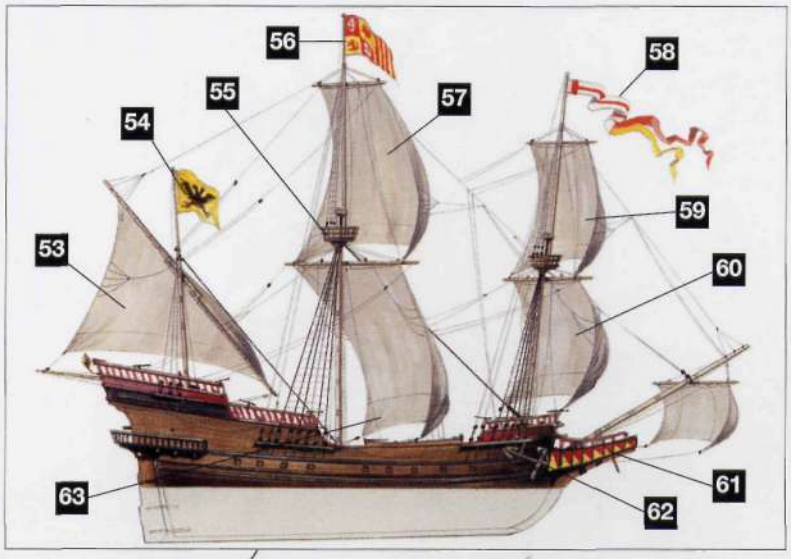
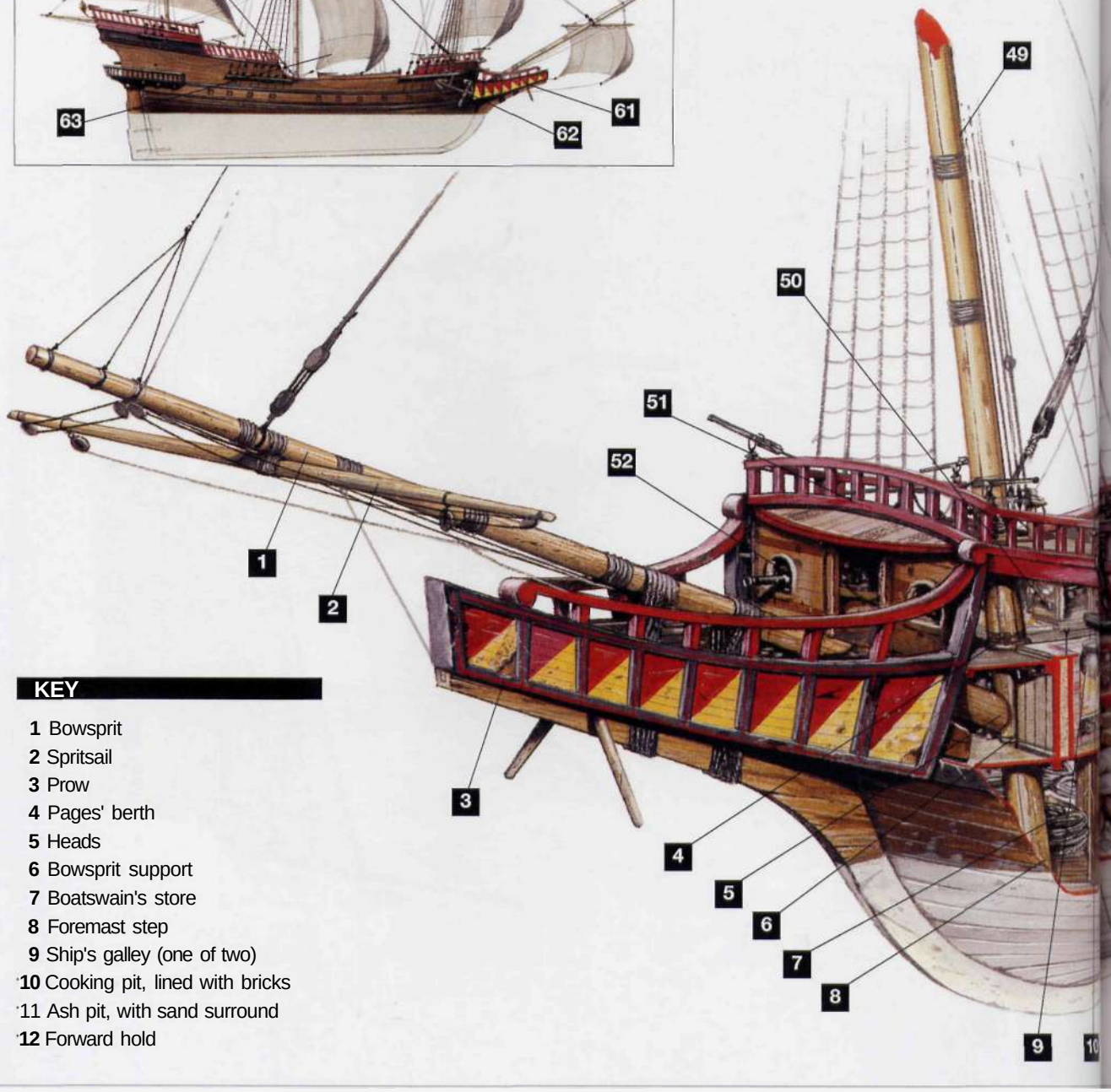
D: THE *NUESTRA SEÑORA DE ATOCHA*, 1622



13 Ship's stores
14 Bread and dry provisions store
15 Powder and shot store
16 Soldiers' berths
17 Water store
18 Main pump
19 Ballast
20 Seamens' berths
21 Treasure hold
22 Gundeck



KEY

1 Bowsprit
2 Spritsail
3 Prow
4 Pages' berth
5 Heads
6 Bowsprit support
7 Boatswain's store
8 Foremast step
9 Ship's galley (one of two)
10 Cooking pit, lined with bricks
11 Ash pit, with sand surround
12 Forward hold

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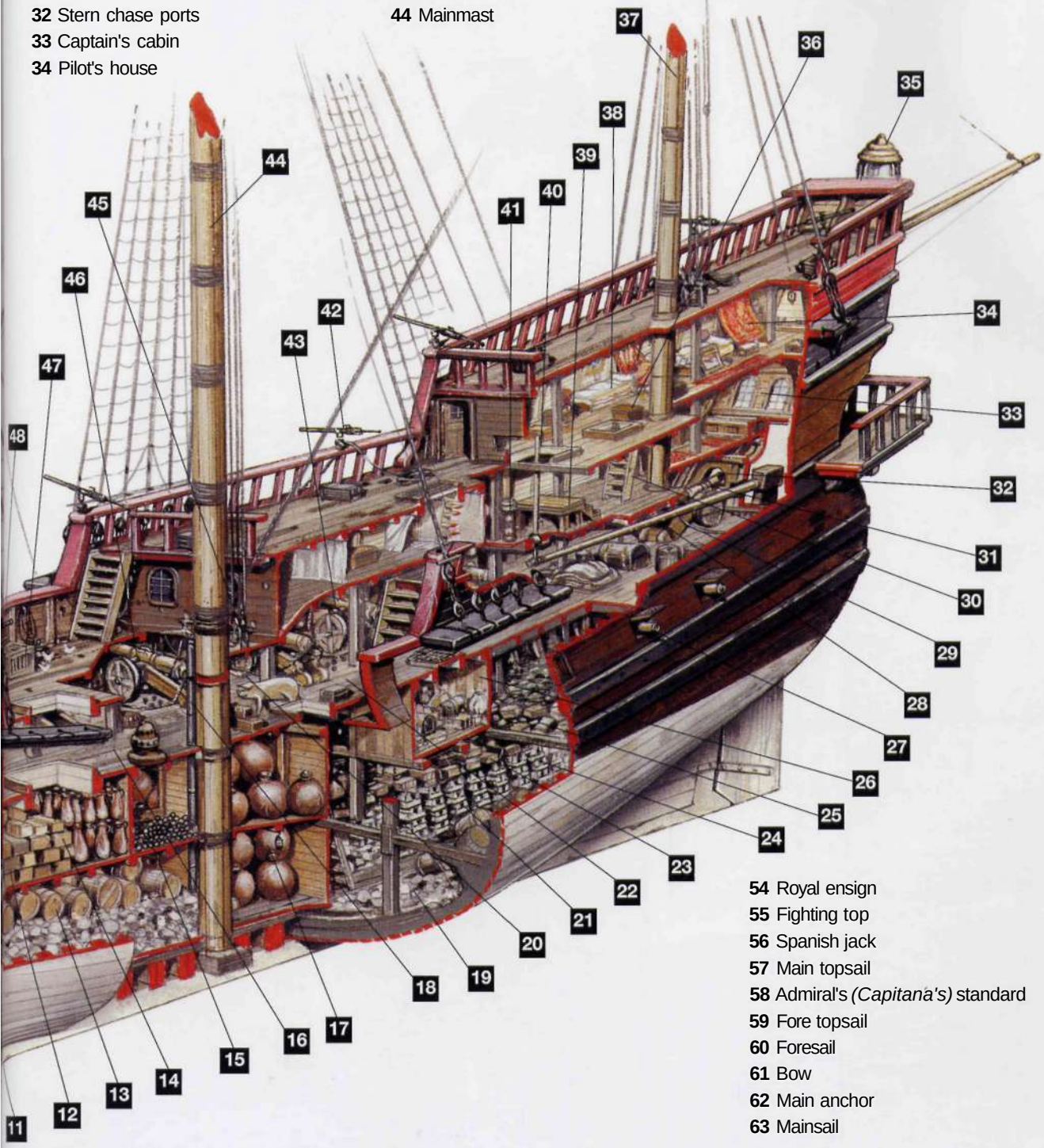
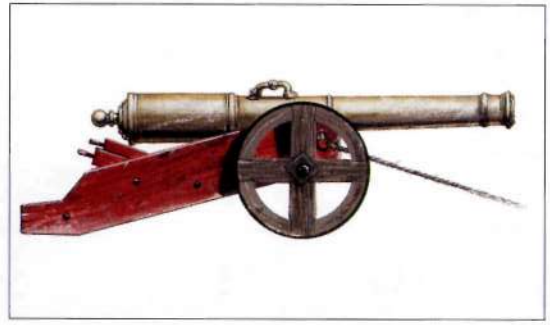
23 Chests containing silver *pesos*
24 Silver ingots
25 Copper ingots
26 Privately owned specie
27 Gunport
28 Tiller
29 Gunner's 'ronda'
30 Master's cabin
31 *Medio culebrina*
32 Stern chase ports
33 Captain's cabin
34 Pilot's house
35 Ship's lantern
36 Silvermaster's cabin
37 Mizzen mast
38 Passenger cabins
39 Hellman's position
40 Whipstaff
41 Compass binnacle
42 *Verso*
43 *Culebrina*
44 Mainmast
45 Ship's bell
46 *Canon* (cannon)
47 Waist
48 Apprentices' berths
49 Foremast
50 Weapons store
51 Forecastle
52 *Sacre*
53 Lateen-rigged mizzen



54 Royal ensign
55 Fighting top
56 Spanish jack
57 Main topsail
58 Admiral's *(Capitana's)* standard
59 Fore topsail
60 Foresail
61 Bow
62 Main anchor
63 Mainsail

E: The *San Felipe,* 1629



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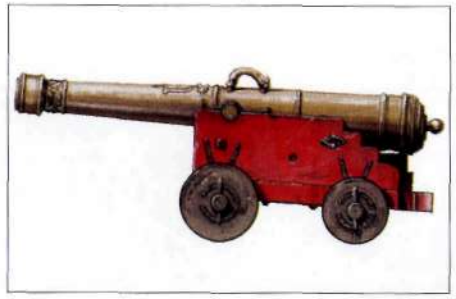
F: The *Santa Teresa* at the Battle of the Downs, 1639

F

G: The *Nuestra Sehora de la pura y limpia Concepción*, 1641



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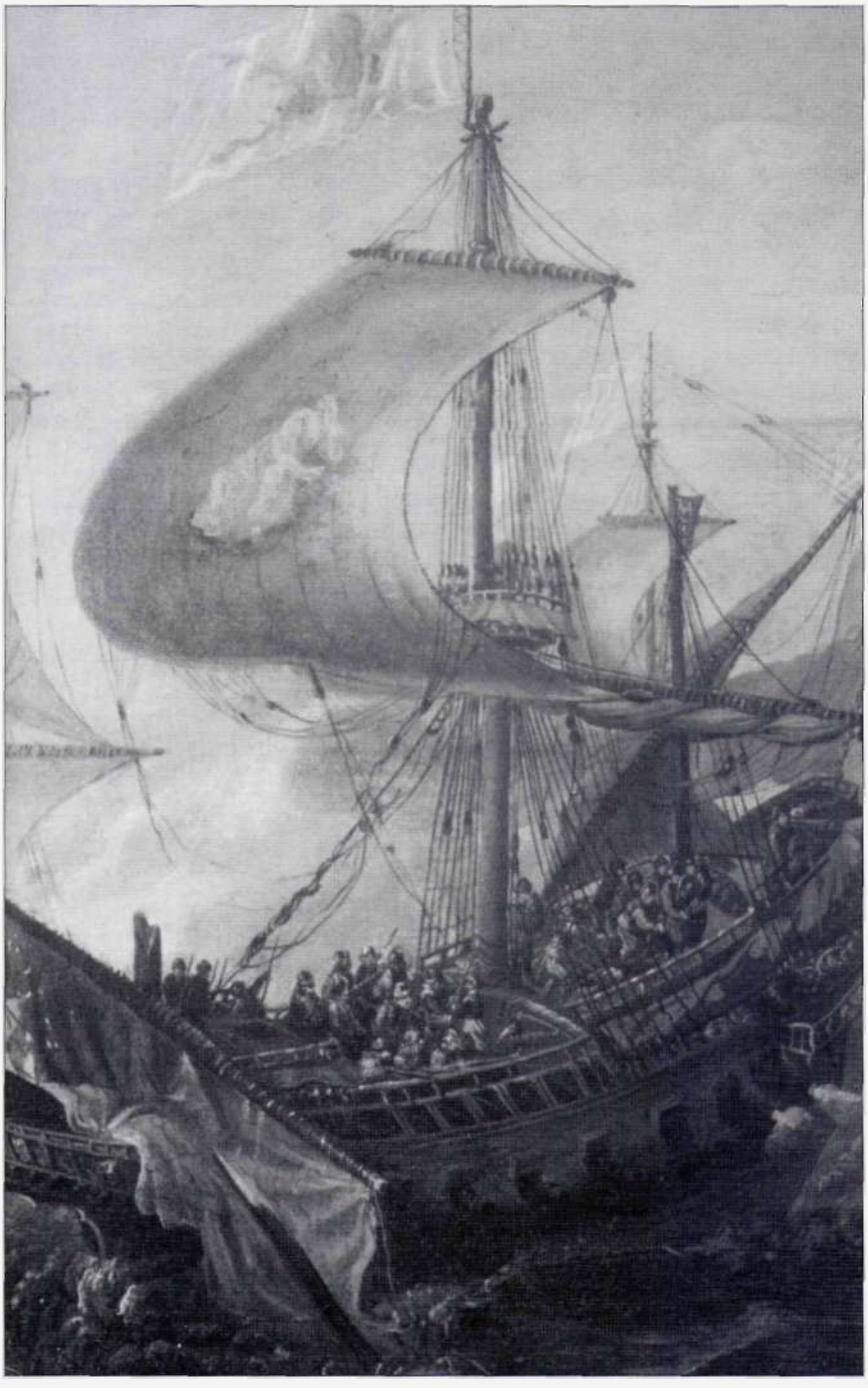
Life on board

Space was extremely limited on board a Spanish galleon. A typical galleon of the early 17th century, such as the *Nuestra Senora de los Tres Reyes* (450 toneladas) built in 1628, had a crew of around 200 men. They had to fit inside a hull whose main deck measured just 53 by 17 *codos* (29.9 by 9.6m), or just over 1.4 square metres per man. Of course, for the capitan and his officers, conditions were relatively more comfortable. The captain's cabin was at the after end of the upper deck, a space shared with the capitan de guerra if one was carried. The pilot lodged in the *camarote*, the space aft of the poop deck, while the master lodged on the deck below, near the helmsman's position. The chaplain also lodged in the cabin space of the upper deck. While the capitan and his other senior officers had some degree of privacy (particularly the capitan, whose accommodation was the most spacious compartment on board), junior officers or passengers often had to make do with temporary sleeping spaces, screened from the rest of the ship by curtains or wooden screens. Some officers even lodged on the lower deck if passengers were being carried, as the renting out of sleeping space was considered a lucrative perk for these junior officers. Accounts of treasure galleons speak of a warren of screened-off spaces and passageways in the upper deck space abaft the mainmast. In daylight, most of these temporary screens were removed.

As for the rest of the soldiers and crew, in theory they slept on the lower deck, but many preferred the fresh air of the upper deck when at sea. The master gunner and his men lodged together, at the stern of the lower deck, amongst any stern chase guns which might be carried. Immediately forward of this space the surgeon lodged amid his chests, saws and potions. Further forward, the able seamen berthed in the space between the mainmast and the mizzen, or on the forward part of the quarterdeck.

The Spanish soldier rather than the gunner was the key figure in Spanish naval tactics during the early 17th century. In this detail from a painting by an unknown artist depicting the Battle of Fuengirola (1622), musketeers and arquebusiers line the rail, while ordnance is fired from the stern. (Museo Naval, Madrid)



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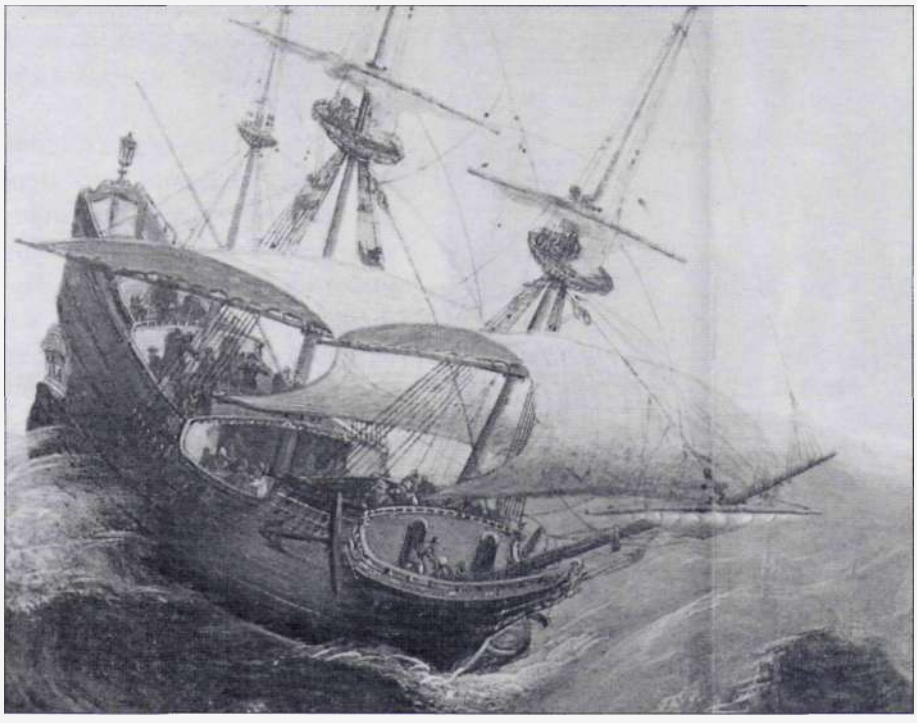
Apprentice seamen berthed on the lower deck between the fore and main masts, while the pages slept wherever was left.

The soldiers had their own system, with any embarked company sleeping on the starboard side of the lower deck (or upper deck in good weather), along with their sergeant. If an almirante or capitan-general was embarked, the capitan gave up his accommodation, unless the vessel was commodious enough to have two large stern cabins. Everyone then moved down one in the accommodation pecking order. If extra troops were embarked, they invariably slept on the main deck, or even on a network of ropes resembling a large fishing net, slung over the waist, and stretched between the forecastle and sterncastle.

With all this humanity crammed into a small space, sanitation was considered a major problem. A lack of proper toilet facilities meant that, while on some ships men used *jardines* (gardens) hung over the stern quarters, or heads in the prow, many others used buckets, or the bilges, which soon stank of human excrement. (The bilge was the space below the hold where seawater and waste collected, and in warm waters anyone opening the hatches into the bilges was liable to be knocked unconscious by the noxious fumes.) Eugenio de Salazar, a passenger writing of his experiences on board a galleon in 1573, recorded that in the waist the pump which 'sucked up the foul waters from the bilge' was always 'steaming like hell, and stinking like the devil'. This attracted rats; while preparing for their homeward voyage at Havana in 1622, galleons of the 1622 treasure flota (including the *Nuestra Senora de Atocha*) suffered from an infestation of rats, in which over a thousand were killed on one ship alone. Rats were not only a health risk; they also ate stores, polluted fresh water supplies and damaged sails and cordage. Galleons frequently carried animals for slaughter as provisions, most commonly chickens, pigs, goats and sometimes cattle. Horses and cattle were also occasionally transported for use by soldiers or colonists in the New World. Waste from the animals



Typical of the smaller Indies flota galleons, the vessel in this painting is shown riding out a storm under easy sail. *Galleon in a Storm;* oil painting by an unknown Dutch artist. (Mel Fisher Maritime Museum, Key West, Florida)

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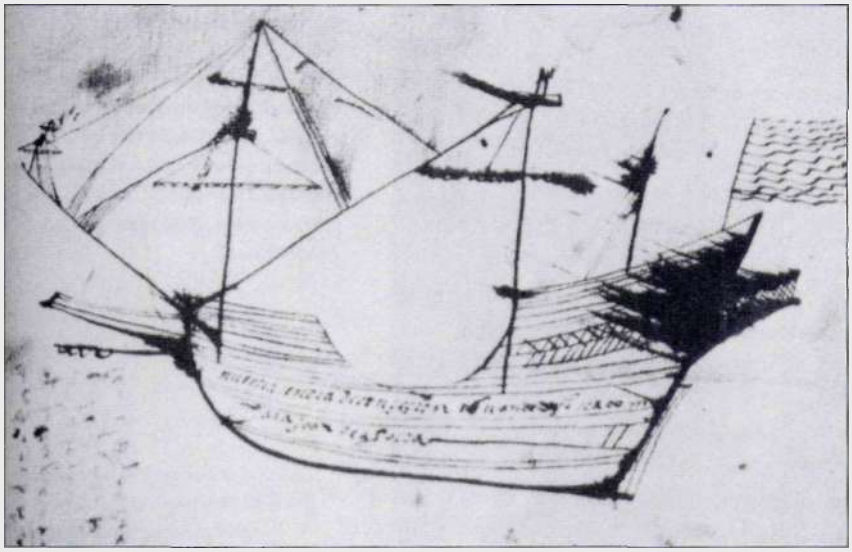

Contemporary sketch of a large Spanish galleon from Guipuzcoa (the Basque region around San Sebastian), which together with the neighbouring area around Bilbao was renowned as a centre of shipbuilding. The sketch, which is dated 1611, shows an unusual spritsaii arrangement, which mirrors the sail plans of later 17th-century warships. (Archivo General de Indias, Seville)

also added to the problems and in addition rats could torment these animals and livestock, or even kill them. Almost as bad were the smaller kinds of vermin: cockroaches, scorpions, mice, and of course lice and fleas. Even when cabins and lower decks were regularly fumigated, there was almost no escape from fleas or lice on board a galleon during this period, whatever the social rank of the sailor, soldier or passenger. Passengers must have viewed the end of a voyage with some relief.

When a galleon was at sea, the daily routine was according to a system of watches, and the passing of time was noted by the turning of a sandglass located beside the helmsman's position. A three-watch system was used, with each third of the ship's company standing a four-hour watch twice a day. The first watch from midnight to 8.00am was supervised by the pilot, the forenoon and afternoon watch by the master, and the evening watch by the captain. The crew changed watches in the middle of each eight-hour watch period: By the 17th century, it is likely that the afternoon watch was split into two 'dog watches', to permit a rotation of the watch rota. Daybreak was marked by the chanting of prayers by the pages, followed by a 'Pater Noster' and an 'Ave Maria'. Religious chanting also marked the change of each watch, and even the turning of the 30-minute 'hourglass'. Meals were taken around the times of the daylight watch changes.

While passengers and officers provided their own stores of food, the fare of the seamen and soldiers was extremely limited. Ship's biscuit made from wheat flour ($1^1/_2$ pounds or 0.7 kg per man per day) and a portion of *menestra* (a mix of chickpeas, lentils, rice and broad beans) were the basic staples. The men were also given a daily ration of $^1/_2$ *azumbre* (2 pints or just over 1 litre) of rough red wine each. Traditionally, this was augmented by boiled salted beef on four days of the week, while boiled salted fish or sardines were eaten on Wednesdays, Fridays and Saturdays. In northern European waters, local beer or cider was occasionally used instead of wine. Cheese was sometimes served instead of meat when bad weather or impending battle made it impossible to light the galley fires. Olive oil, vinegar, and usually onions, olives and garlic helped improve the flavour of the food. Cooking was performed at prescribed times either individually, or in *ad hoc* groups. Incidentally, because of this largely Mediterranean diet, Spanish seamen suffered less from scurvy than the seamen of other maritime nations. In fact, it was so uncommon that the Spaniards called it the 'Dutch Disease'. While not particularly appetising, it was at least a sustaining and reasonably healthy diet.

While the diet might have been satisfactory, conditions on board were often appalling, and galleons provided a rich breeding ground for disease. Mortality rates were high throughout 16th- or 17th-century Europe, but on board Spanish ships in Caribbean waters the situation was much worse.

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During the Battle of Gibraltar (1607), the Spanish flagship of Don Juan Alvarez was ripped apart when her powder magazine caught fire. *The Battle of Gibraltar, 1607;* oil painting by Hendrik Cornelisz. Vroom (1566-1640). (Rijksmuseum, Amsterdam)

Rates of 15-20 per cent of the ship's company have been noted as commonplace for a return trip from Spain to the Indies, and when yellow fever or other tropical diseases took hold in vessels the mortality rate would spiral. In other words, life on board a 16th- or 17th-century Spanish galleon was similar to that in the plague-infested and overcrowded cities at home, with the added risk of death through batde or shipwreck, and the further added risk of encountering exotic tropical diseases.

Galleons as warships

Throughout the age of the galleon, the Spanish never realised the full potential of their naval artillery. For most of the 16th century, shipborne ordnance was regarded as a supporting weapon, used to soften up the enemy prior to the decisive boarding action. After the experience of the Spanish Armada campaign of 1588, Spanish naval commanders came to view their artillery as a more versatile weapon, and trained their crews to conduct stand-off artillery duels as well as boarding actions. Indeed, this practice had begun as early as the 1520s, but it was never fully adopted by the Spanish apart from when engaging targets on shore. During the 16th and early 17th centuries, Spanish naval ordnance was invariably mounted on single-trailed, two-wheeled carriages, more akin to those

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found on land than associated with use at sea. This changed during the first half of the 17th century, as the Spanish gradually adopted the form of carriage which by this stage was widely used by all other maritime powers. Therefore, by 1630 at the latest, the heavy ordnance carried on board galleons was exclusively mounted on practical four-wheeled carriages using trucks rather than large wheels; in effect primitive versions of the carriages used by all Atlantic naval powers throughout the 18th century. In addition, the obsolete wrought-iron breech-loading guns, which were carried for much of the 16th century, were gradually phased out and replaced by more reliable bronze muzzle-loading pieces. These earlier pieces were adequate when used as point-blank weapons, but lacked the range to participate in longer-range bombardments or artillery duels. Although some of these old guns were still carried on the ships of the Spanish Armada of 1588, they had been relegated to the protection of hulks and supply ships, not the galleons which made up the main striking force of the Spanish fleet.

By the time of the Spanish Armada, Spanish galleons carried modern bronze ordnance (albeit mounted on inefficient two-wheeled carriages), but their commanders had still not worked out the best way to use them. A detailed analysis of ammunition expenditure during the campaign (published in Martin & Palker, 1988) shows that even as late as 1588, the Spanish still clung to the notion of fighting boarding actions at sea rather than artillery engagements. The larger guns of the fleet were rarely fired, while the expenditure of shot by smaller versos was prodigious. This is explained by the Spanish method of using naval ordnance during this

Spanish and English warships shown in close combat during the closing stages of the Spanish Armada campaign of 1588. Contrary to popular belief, most of the Spanish ships were not galleons, and many were smaller than their English counterparts. *English ships and the Spanish Armada, August 1588;* oil painting by an unknown English artist, late 16th century. (National Maritime Museum, Greenwich, London)

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The Dutch withdraw to their ships after an abortive amphibious attack. Spanish seaborne soldiers would have been virtually identical to these Dutch troops. *The recovery of San Juan de Puerto Rico;* oil painting by Eugenio Caxes (1572-1634). (Museo del Prado, Madrid)

period. Each Spanish gun was placed under the command of a ship's gunner, assisted by a crew of sailors and soldiers. Once the piece was loaded, the crew dispersed to their other action stations, leaving the gunner alone, clutching his burning matchcord, waiting for the order to give fire. Spanish naval doctrine emphasised the collective firing of the ship's broadside guns immediately before boarding an enemy vessel. The superbly trained Spanish infantry would then board the enemy vessel 'in the smoke'. Given this tactic, there was simply no need to reload the gun until the action was over.

In other words, the Spanish viewed their ordnance as weapons designed to support their infantry rather than the primary offensive weapon of the ship. Throughout the era of the galleons, it was the ship-borne Spanish infantry who formed the most potent weapon in the Spanish naval arsenal. Other maritime powers were unable to match these Spanish infantry in close combat at sea, which meant that if a Spanish galleon managed to grapple and board an enemy ship, the enemy vessel was as good as lost. During the Battle of the Azores (1582) the effectiveness of this doctrine was demonstrated when Spanish boarding parties captured the core of the opposing French fleet in a brief but hard-fought action. In 1588 the Spanish simply planned to use the same tactic.

The 1588 campaign demonstrated that, in terms of tactical thinking, the Spanish had been overtaken by their rival maritime powers. During the campaign the English commanders consistently refused to let the Spanish board their ships, preferring to remain outside 'caliver range' and fight an artillery duel. This forced the Spanish to re-evaluate their tactics, and come up with a way to use their ordnance in a more versatile fashion. The first remedy was to detach the soldiers from artillery duty, leaving it up to the sailors to handle the guns. After all, they were more skilled in the mechanical tasks involved. Next, a review of carriages was made and, although it took four decades, the Spanish introduced more suitable carriages. Finally they turned their back on large and prestigious

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(and therefore cumbersome) warships, favouring smaller galleons, such as those built for the Indies trade rather than service in the fleet in European waters. All this took time. To be fair, other maritime powers were also trying to work out how to use warships as floating batteries, and it was not until the mid-17th century that the English and Dutch developed the concept of the line-of-battle.

The Spanish Armada of 1588 had also managed to fulfil its task of maintaining a tight formation as it progressed up the English Channel. Only two ships were lost during this period from a fleet of 120 vessels, and those losses occurred through accidental damage rather that from enemy fire. The Spanish may have re-evaluated their tactical doctrines, but little change was made to the way a fleet was handled. If anything the 1588 campaign vindicated Spanish fleet handling.

By the early 17th century, Spanish combat instructions were issued to help individual ships prepare themselves for batde. Although produced after the 1588 debacle, we can infer that at least some of these doctrines were first developed during the 16th century. Detailed instructions were provided concerning the use of naval artillery. In theory guns were kept ready for use at all times, although the time needed to prepare a ship for action was increased on galleons of the Indies flotas, as the gun deck was usually filled with stores and cargo as well as the crew and their belongings. Also, most galleons were armed with guns of several calibres. Shot of each calibre was stored separately, and to avoid errors during a battle, the calibre of each gun was painted on a notice pinned on the beam over each gun. Normally, one gunner supervised each gun, and the remainder of his crew (normally six to eight men) was formed from the

By the middle of the 17th century the Spanish had recovered from the Armada disaster of 1588, and were able to contest the Protestant maritime powers who tried to make inroads into the Mediterranean. This oil painting by an unknown Spanish artist records the minor victory of Don Fadrique de Toledo off Gibraltar over the Dutch in 1621. (Museo Naval, Madrid)

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Under the command of the veteran Spanish admiral Don Fadrique de Toledo y Osorio, a Spanish *galiflota* spearheaded a series of amphibious attacks in the Caribbean during 1629, where the galleons bombarded the shore while seaborne troops stormed ashore to capture the Dutch or English positions. *The recapture of San Cristobal;* oil painting by Juan Bautista Maino (1578-1649), detail. (Museo del Prado, Madrid)

ranks of the remaining gente de mar, with each piece being allocated a certain number of able seamen, apprentices and pages. The pages were used to maintain the supply of ammunition, running between the *panol de polvora* (powder magazine) and the guns with bags of powder carried in leather containers. Occasionally, soldiers would be drafted to assist in the operation of the guns. The master gunner took his orders from the infantry commander during an action rather than the maestre, and he controlled the operation of all heavy guns and versos. In effect, this meant that the infantry commander took charge of the ship during an action, whether he was a capitan de mar y guerra or simply a capitan de guerra.

During a battle the infantry were stationed throughout the ship. According to operational orders, a squadron containing the most experienced men should be stationed in the forecastle, under the command of its *cabo.* Other squadrons were grouped in the waist, on the quarterdeck and on the poop deck. Ideally, if sufficient men were available, a reserve would be kept below decks, for use as a boarding party, or to repel any attack. As approximately half of the soldiers on board were armed with small-arms, infantry firepower played a major part in any close-range battle. Each squadron (whether in the forecastle, waist, quarterdeck or poop) relied on its musketeers and arquebusiers to open the battle, firing in two makeshift ranks, allowing one to fire from the gunwale while the other retired to the centreline to reload. Soldiers armed with close-combat weapons mustered on the opposite side of the deck, keeping out of the way until called into action. If an attack was ordered, the boarding party would usually muster in the forecastle. According to the guidelines issued to the Armada de la Guardia in the late 16th century, these boarders should consist of men with sword and buckler, *chuzos* (half-pikes) and arquebus in equal proportions. Any assault would be accompanied by the throwing of incendiaries and grenades, while the men in the waist remained ready to extinguish similar projectiles thrown by the enemy. Similar instructions issued in 1630 prove that a similar mixture of troops was used during the early 17th century.

We can determine something of the effectiveness of this ship-borne organisation by the results of engagements fought during the early

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17th century. Like several of the engagements fought against the Dutch during the first three decades of the century, the total loss of the Indies flota of 1628 at Matanzas Bay in Cuba was the result of mismanagement. The flota commander, Don Juan de Benavides, accidentally ran his four galleons and accompanying merchantmen aground, allowing them to be captured by the Dutch squadron of Piet Heyn. Heyn recorded that the Spanish guns carried on the galleons were mounted on four-truck carriages. The following year Don Fadrique de Toledo made good use of these mountings when he successfully engaged a Dutch squadron off the Azores. His squadron then went on to land its shipborne troops in the West Indies, where they captured the islands of San Cristobal (St. Christopher) and Nieves (Nevis) under cover of supporting naval gunfire from the galleons. This mirrored a similar use of naval bombardment at the recapture of Bahia in Brazil (1625). The Spanish were clearly learning the value of powerful long-range broadsides.

Although the Dutch posed a serious threat to Spanish interests in the Americas, the real threat lay in European waters. For much of the Thirty Years War (1618-48), the Spanish fleet achieved little apart from the regular operation of convoys between Spain and Flanders. The naval conflict escalated in 1635, when France entered the war against Spain. During a series of running engagements fought in the English Channel in 1637, a Spanish armada engaged and defeated Dutch and French squadrons using long-range artillery fire. The following year all but one vessel from a heavily outnumbered Spanish squadron of 12 galleons was lost despite the sound tactical skills displayed by its commander, Don Lope de Hoces. During the engagement the Spanish anchored their ships in line astern across a harbour mouth, and relied on artillery to keep the French at bay. Ten French ships were damaged and captured before the Spanish squadron was destroyed by a combination of fireships and scuttling.

Don Fadrique de Toledo, the Spanish naval commander who recaptured Bahia in Brazil (1625), is shown standing beside the painting of King Philip IV. The Admiral was placed in the background of this commemorative painting after falling foul of the king in the years following his victory. Several galleons from his fleet can be seen in the background. *The recapture of Bahia;* oil painting by Juan Bautista Maino, detail. (Museo del Prado, Madrid)

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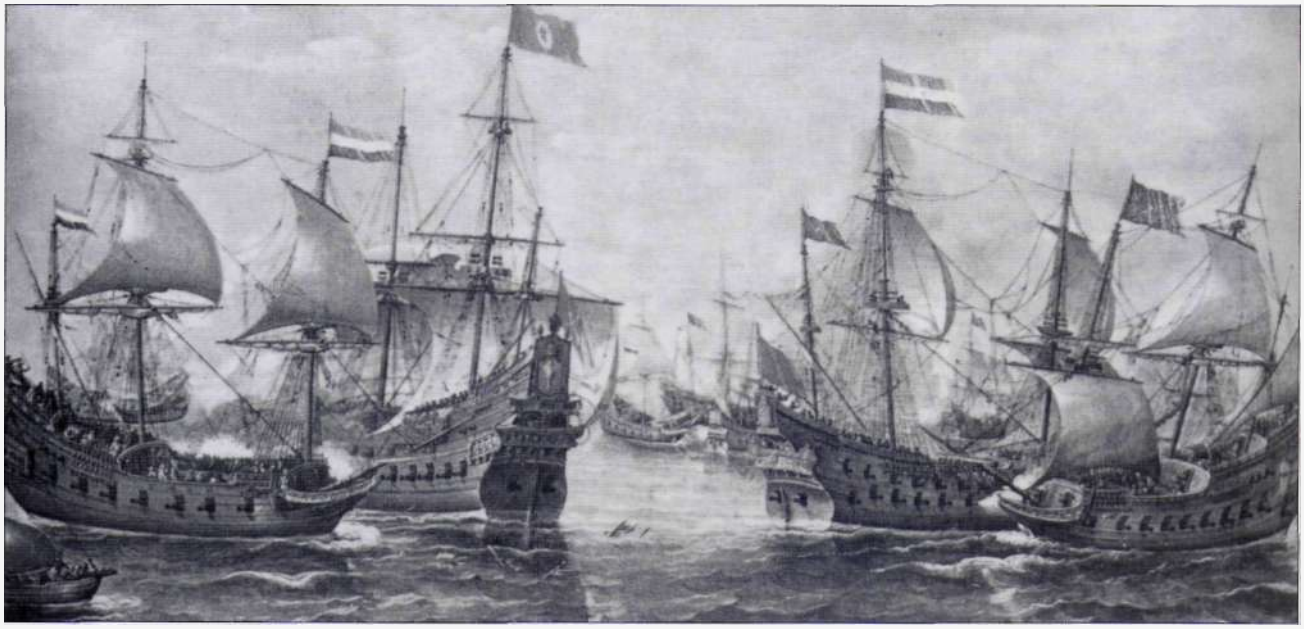

The Battle of the Downs, 1639, showing the flagship of Don Antonio de Oquendo fighting off Dutch warships, while a second Spanish galleon (right) moves up to support the fleet commander. Engraving based on the oil painting by Cornelisz. Verbeek (c. 1590-1635). (National Maritime Museum, Greenwich, London)

A more dramatic display of the new-found Spanish enthusiasm for artillery is found in accounts of the two-stage Battle of the Downs (1639), fought between a Spanish armada of 67 ships (most of them galleons) and a slightly smaller Dutch squadron. During the first encounter, fought during 16-18 September, the Spanish were battered but undefeated in a three-day running artillery duel. Spanish commander Don Antonio de Oquendo led his fleets over to the neutral English side of the channel, where his ships replenished their supplies of powder off the Downs. Soon, a larger Dutch fleet under Admiral Maarten Tromp's reinforcements arrived to strengthen the Dutch fleet, and the battle recommenced on 21 October when Olivares set sail in an attempt to run through the Dutch fleet and escape. Although most of the fleet succeeded in getting away, nine galleons were captured or destroyed. Dutch fireships destroyed the galleon *Santa Teresa*, the flagship of Don Lope de Hoces, while the Spanish commander was fighting eight Dutch ships simultaneously. Almirante Feijoo put up an equally impressive fight when his galleon held off a whole Dutch squadron for 18 hours before surrendering. Of the remaining seven Dutch prizes, six sank before they could be towed to Holland, as they had been so badly battered during the fighting.

On board his capitana, the *Nuestra Senora de la Conception y Santiago*, Oquendo ordered his crew to furl their sails, planning to buy time for the rest of his armada to escape. After holding off the Dutch until nightfall, Oquendo's galleon was rescued by the galleons of the Squadron of Flanders, which fought their way through the Dutch at dusk, then escaped during the night with the capitana safely in their midst. Although this engagement resulted in a Spanish defeat, the action demonstrated that, when commanded by veteran captains, the Spanish galleons of the period could hold their own in artillery duels against their enemies. Incidentally, it also demonstrated another Spanish trait: that, for much of the period, Spanish naval commanders were often given insufficient resources to perform a task, but through their professionalism and resourcefulness they managed either to succeed or at least hold their own against more powerful adversaries.

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The Battle of the Downs was the last hurrah of the galleon. Within a few years the adoption of new line-of-battle tactics would lead to a new breed of heavily armed ships-of-the-line. While galleons remained in service in the Indies for another two decades, their heyday had passed, and never again would they form part of a Spanish fleet. A ship type which had defined the age of Spanish achievement in the New World finally passed into the realm of history and legend.

BIBLIOGRAPHY

Arnold, J. Barto, & Weddle, Robert S.; *The Nautical Archaeology of Padre Island: The Spanish Shipwrecks of 1554;* Academic Press (New York, NY, 1978)

Bass, George F. (ed.); *Ships & Shipwrecks of the Americas: A history based on underwater archaeology;* Harper & Row (New York, NY, 1979)

Davis, Ralph; *The Rise and Fall of the Atlantic Economies;* Cornell University Press (Ithica, NY, 1973)

Elliot, J.H.; *Imperial Spain, 1469-1716;* St. Martin's Press (London, 1964)

Glete, Jan; *Warfare at Sea, 1500-1650: Maritime Conflicts and the transformation of Europe;* Routledge Press (London, 2000)

Guilmartin, John F.,Jr.; *Galleons and Galleys;* Cassell (London, 2002)

Haring, C.H.; *Trade and Navigation between Spain and the Indies at the time of the Hapsburgs;* P. Smith Publishing (Gloucester, MA, 1964)

Hattendorf, John B., & Unger, Richard W. (eds.); *War at Sea in the Middle Ages and Renaissance;* Boydell Press (Woodbridge, Suffolk, 2002)

Kirsch, Peter; *The Galleon: Great Ships of the Armada Era;* Naval Institute Press (Annapolis, MD, 1990)

Konstam, Angus; *The History of Shipwrecks;* Lyons Press (New York, NY, 1999)

Konstam, Angus; *The Armada Campaign, 1588: The Great Enterprise against England;* Osprey (Oxford, 2001)

Martin, Colin, & Parker, Geoffrey; *The Spanish Armada, 1588;* Hamish Hamilton Publishing (London, 1988)

Mathewson, R. Duncan, III; *Treasure of the Atocha;* E.P Dutton Press (New York, NY, 1986)

Parry, John H.; *The Spanish Seaborne Empire;* Knopf (New York, NY, 1966)

Perez-Mallaina, Pablo E.; *Spain's Men of the Sea: Daily Life on the Indies Fleet in the Sixteenth Century;* Johns Hopkins University Press (Baltimore, MD, 1998)

Phillips, Carla Rohn; *Six Galleons for the King of Spain;* Johns Hopkins University Press (Baltimore, MD, 1986)

Stradling, RA; *Europe and the decline of Spain: A study of the Spanish system, 1580-1720;* George Allen & Unwin (London, 1981)

Unger, Richard W. (ed.); *Cogs, Carvels and Galleons: The Sailing Ship, 1000-1650;* Conway Maritime Press (London, 1994)

Wagner, Kip; *Pieces of Eight: Recovering the Riches of a lost Spanish Treasure Fleet,* E.P. Dutton (New York, NY, 1966)

Walton, Timothy R.; *The Spanish Treasure Fleets;* Pineapple Press (Sarasota, FL, 1994)

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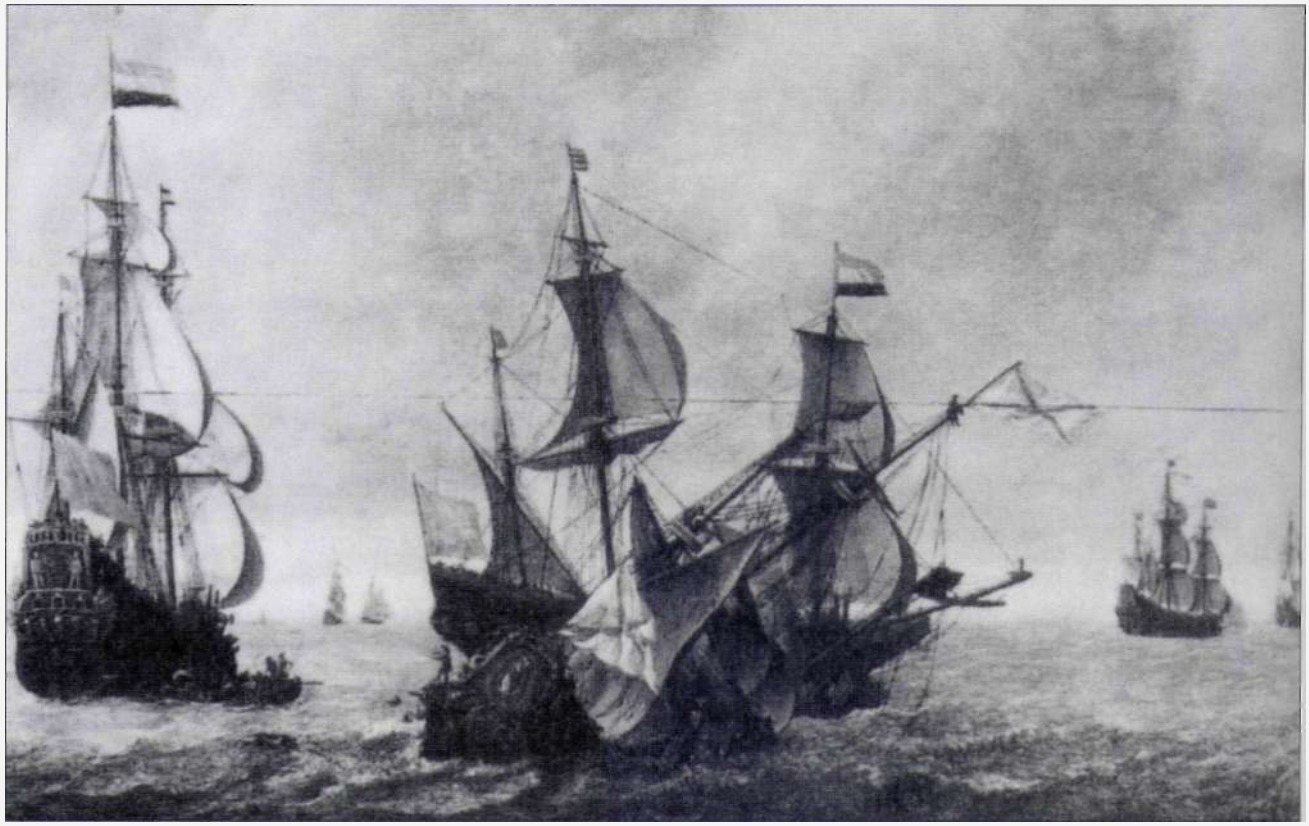

In this Dutch engraving depicting the Battle of the Downs (1639), the Spanish galleon in the foreground has been sunk by gunfire from the Dutch warships surrounding her. In fact most Spanish losses occurred after the battle, when the Dutch tried to tow their prizes home in rough seas. (Stratford Archive, London)

A: THE *SAN ESTEBAN,* 1554

The Spanish galleons built during the mid-16th century differed from later vessels in that they more closely resembled the *nets,* carvels or carracks which formed the bulk of Spain's merchant fleet, lacking the towering stemcastle structures of the later galleons. Our understanding of these early galleons comes from a combination of pictorial evidence, ship models and archaeological data. This reconstruction combines all three sources.

After leaving Vera Cruz in Mexico bound for Havana, the New Spain flota of 1554 encountered a hurricane in the Gulf of Mexico, and several ships were lost, including the galleon *San Esteban* and its cargo of some 2 million silver *pesos* ('pieces of eight'). Almost all of the survivors later perished as they tried to reach the nearest Spanish settlement. During the late 1960s three Spanish 16th-century shipwrecks were discovered off Padre Island in Texas. These wrecks were duly excavated by archaeologists from University College Texas, and were tentatively identified as the *San Esteban,* the *Santa Maria de Yciar,* and the *Espirito Santo,* all from the 1554 flota. A small amount of hull structure was recovered, and this was compared to a contemporary model of a galleon dating from the 1540s. The two matched, suggesting the model was a reasonably accurate representation of a galleon of the period.

Several *bombardettas* were recovered from the shipwreck; these were wrought-iron breech-loading guns, which would have been mounted on wooden beds and carriages of the kind shown in the inset. The weapon could be reloaded by replacing the breech chamber with another loaded chamber, after inserting a new projectile into the breech. This example is based on one of the *San Esteban's* guns.

B: THE *SAN MATEO* AT THE BATTLE OF THE AZORES, 1582

The battle fought off the Azores in 1582 was probably the first major naval engagement in history to be fought out of sight of land. When Spain conquered Portugal in 1580, the only portion of the Portuguese overseas empire to resist the Spanish was the Azores. In 1580 the French crown sent a fleet under the command of the mercenary Admiral Filipo Strozzi to help defend the islands. This action resulted in the Spanish sending their own fleet to the Azores, under the command of the veteran Captain-General Don Alvaro de Bazan, Marquis of Santa Cruz. The two fleets met some 18 miles south of the island of Sao Miguel on 26 July (the battle is sometimes named after the island's port, Punta Delgada). Strozzi had 40 warships at his disposal, and Bazan 21. In addition, each fleet contained a squadron of transports.

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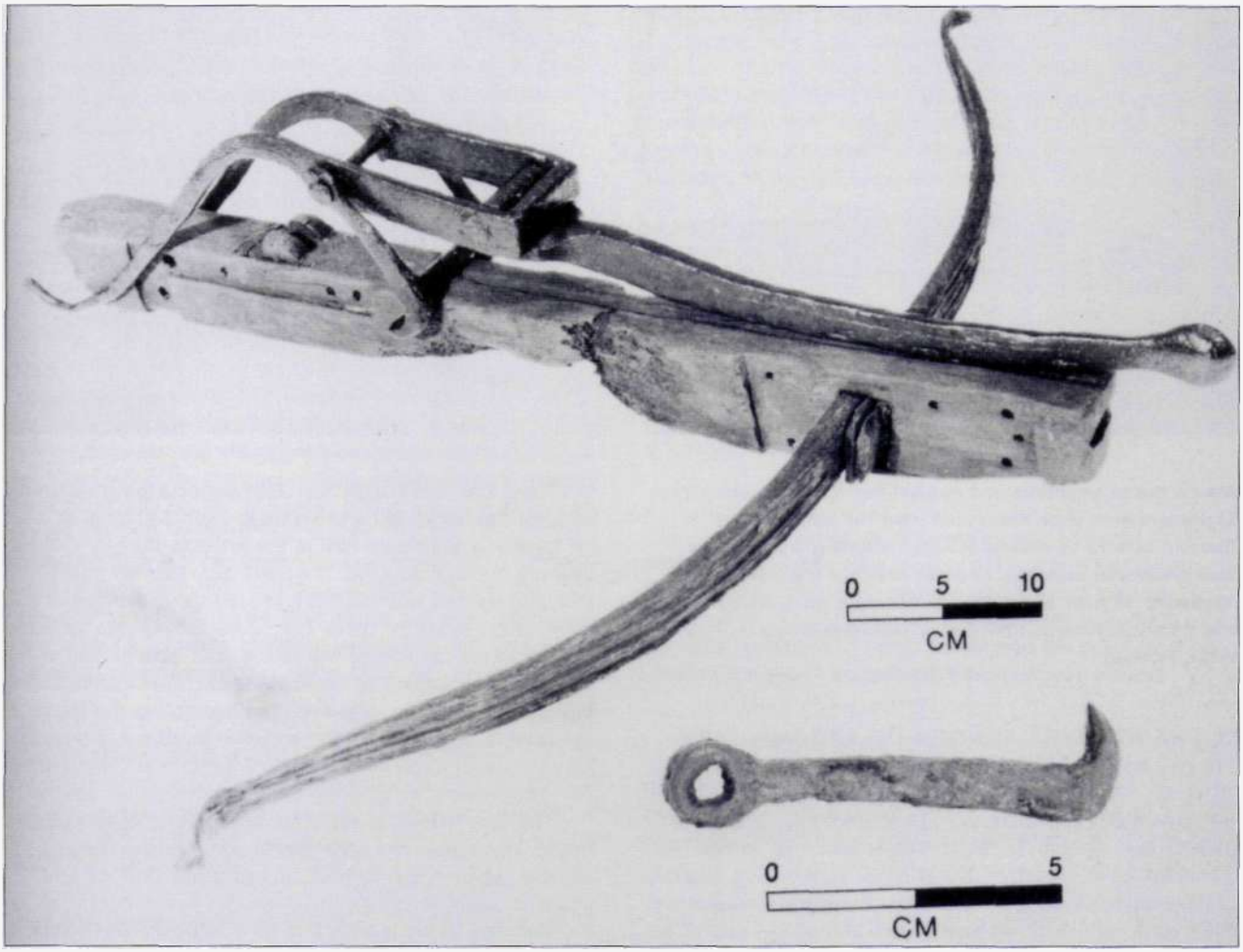

Spanish infantry firearms were late in making an appearance at sea. This crossbow and associated goat's-foot lever were recovered from one of the Padre Island shipwrecks, dating from 1554. (Texas A&M University)

The French opened the battle by engaging the Spanish rear with half of their fleet. Although the Spanish were outnumbered two to one, Bazan managed to bring the rest of his fleet into battle, to give him parity in numbers. The brunt of the French attack was borne by the Portuguese-built galleon *San Mateo,* a vessel of 750 toneladas, armed with approximately 30 guns. Although simultaneously boarded by several French ships her soldiers held their ground, and repulsed all attacks. They then took the fight to the enemy, boarding and capturing two French vessels before the battle ended. Bazan won a stunning victory against superior odds, capturing ten enemy ships in all and driving the French from the Azores. The islands were captured by Spanish troops the following year. The plate shows the *San Mateo* at the height of the fighting.

C: THE *SAN JUAN BAUTISTA,* 1588

One of 22 galleons to take part in the Spanish Armada campaign of 1588, the *San Juan Bautista* (one of two participating galleons bearing the same name) was the almiranta of the Squadron of Castile. She was a modern vessel with a burden of 750 toneladas, a crew of 296 men (including soldiers), and an armament of just 24 guns, excluding the smaller versos. For much of the progress of the Armada up the English Channel she was detached from her squadron, and instead formed part of an *ad hoc* formation of the most powerful vessels in the Spanish fleet. This 'fire brigade' protected the rest of the Armada formation, and consequently the *San Juan Bautista* participated in all of the principal engagements of the campaign. During the fighting off Gravelines (8-9 August) she was one of the four galleons which supported the fleet flagship *San Martin* during her legendary fight against the bulk of the English fleet, and was badly battered in the day-long engagement, her decks reportedly awash with blood. She not only survived the battle, but she subsequently managed to limp home to Spain.

The *San Juan Bautista* was built for service in the Indies flotas, and was well built, with a relatively low profile compared to other galleons. This also accounts for her poor armament as, traditionally, Indies galleons were less well armed than those which saw regular service in the Armada del Mar Oceano. Before she sailed from Lisbon in 1588, her regular armament was augmented by the embarkation of a dozen versos of various sizes.

The inset shows a verso which was recovered from the Spanish Armada shipwreck *La Trinidad Valencera.*

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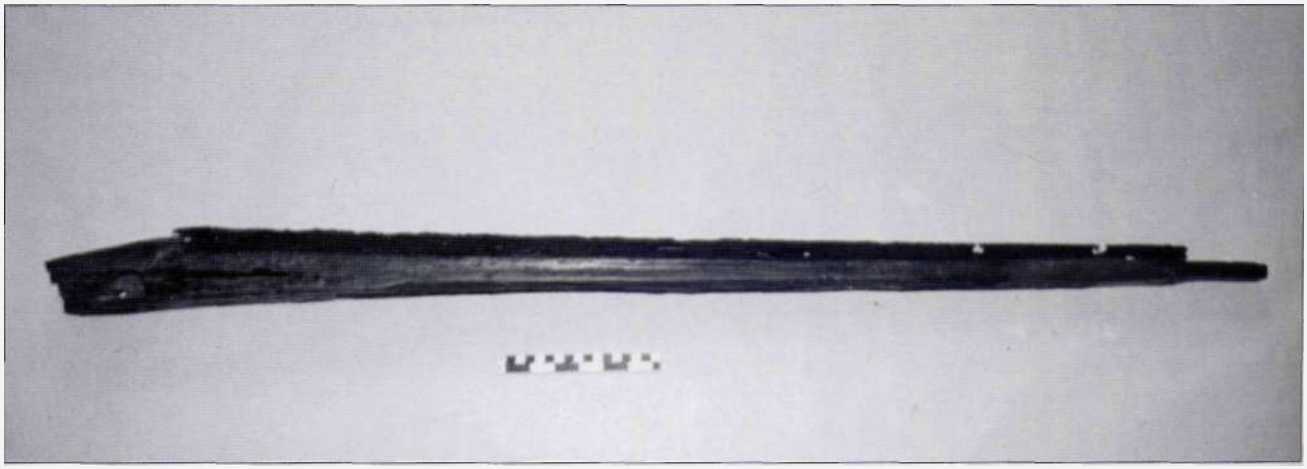

Over a dozen arquebus and musket barrels in various states of preservation were recovered from the wreck of the *Nuestra Senora* de *Atocha* (1622), including this relatively well-preserved example. Records indicate she carried a 'company' of over 100 soldiers, including 20 musketeers and 24 arquebusiers. (Mel Fisher Maritime Museum, Key West, Florida)

D: THE *NUESTRA SENORA DE ATOCHA,* 1622

The galleon *Nuestra Senora de Atocha* was built in Havana in 1618, for use in the Indies flotas. A relatively small vessel of a little over 500 toneladas burden, the *Atocha* carried a crew of 200 men (including 90 soldiers), and was armed with 20 heavy guns, plus from four to eight versos. She was one of three galleons which sank during a hurricane in September 1622, when all 50 of her passengers and all but four of her crew were lost when she was ripped apart after being driven onto a submerged reef. Although some salvage work was undertaken over the next decade, the bulk of her cargo remained on the seabed of the Florida Keys. This included one million silver *pesos* ('pieces of eight') and 20 tons of silver ingots, plus gold and emeralds.

In 1985 the treasure hunter Mel Fisher discovered the wreck, along with that of her consort galleon, the *Santa Margarita,* making this probably the most lucrative find of Spanish treasure ever made. A small team of contracted archaeologists accompanied the salvors, and recorded what they could of this valuable shipwreck. A substantial portion of her lower stern structure was recovered, and this fitted in with documentary information provided from Spanish archives. This reconstruction is based on this information. As a Cuban-built ship, the *Atocha* differed from many of her contemporaries as she was constructed using mahogany rather than oak. An analysis of her remains also proves she was poorly constructed, probably due to 'corner-cutting' by the shipbuilder. This led to an investigation by the Spanish authorities, and may have been a contributory factor in her loss.

E: THE *SAN FELIPE,* 1629

As one of a series of arrangements with private shipbuilders, the Basque shipping magnate Martin de Arana was contracted to build six galleons for the Spanish crown during 1625-28. The *San Felipe, Nuestra Senora de Begona* (both 610 tons), *Los Tres Reyes, San Juan Baptista* (both 450 tons), and the *San Sebastian* and *Santiago* (both 330 tons) all went on to play a significant role in the Armada del Mar Oceano over the coming decades. The *San Felipe* (named after Philip IV's patron saint) was 102ft (31.1m) long, with a beam of 33ft (10m) and carried 24 guns. During her career she sailed to the Caribbean as part of the Indies flota, and served in the Portuguese squadron of the Armada del Mar Oceano during the war with France. She even participated in the Battle of the Downs, and survived the experience. She can therefore be seen as a typical 'workhorse' of the Spanish fleet during the middle decades of the 17th century.

The inset shows a cast-bronze medio culebrina, and is based on a gun recovered from the *Nuestra Senora de Atocha,* which sank in 1622. It bears the coat of arms of Philip III, plus a cartouche bearing the inscription of its founder. The piece is mounted on a two-wheeled carriage, similar to those used on land. A gun of this kind required a crew of six or eight men to operate it, but the carriage made the piece more cumbersome to handle than a similar gun mounted on a four-wheeled carriage.

F: THE *SANTA TERESA* AT THE BATTLE OF THE DOWNS, 1639

When it sailed against the Dutch in September 1639, the Spanish armada of Don Antonio de Oquendo consisted of 67 warships of various sizes, divided into seven squadrons. One of these forces was the squadron of *La Coruna,* which consisted of eight assorted warships, including four galleons. The squadron commander, Don Lope de Hoces, was also the deputy-commander of the armada. His capitana was the 1,100-tonelada galleon *Santa Teresa* armed with 36 guns. During the second phase of the Battle of the Downs, fought on 21 October 1639, the Dutch fleet attacked the Spanish in heavy fog. Most of the Spanish ships either deliberately or accidentally ran aground on the friendly English coast, but the *Santa Teresa* was isolated by a squadron of eight Dutch ships, which launched a simultaneous attack on the capitana, Supported by the squadron almiranta, the *San Felipe* (560 toneladas), Don Lope kept the Dutch at bay throughout the morning until the Dutch launched a fireship attack at the *Santa Teresa.* Without much wind, the galleon was unable to manoeuvre out of their path. One of the fireships reached the galleon, which was soon ablaze. The Spaniards remained at their guns as long as they could, then the handful of survivors

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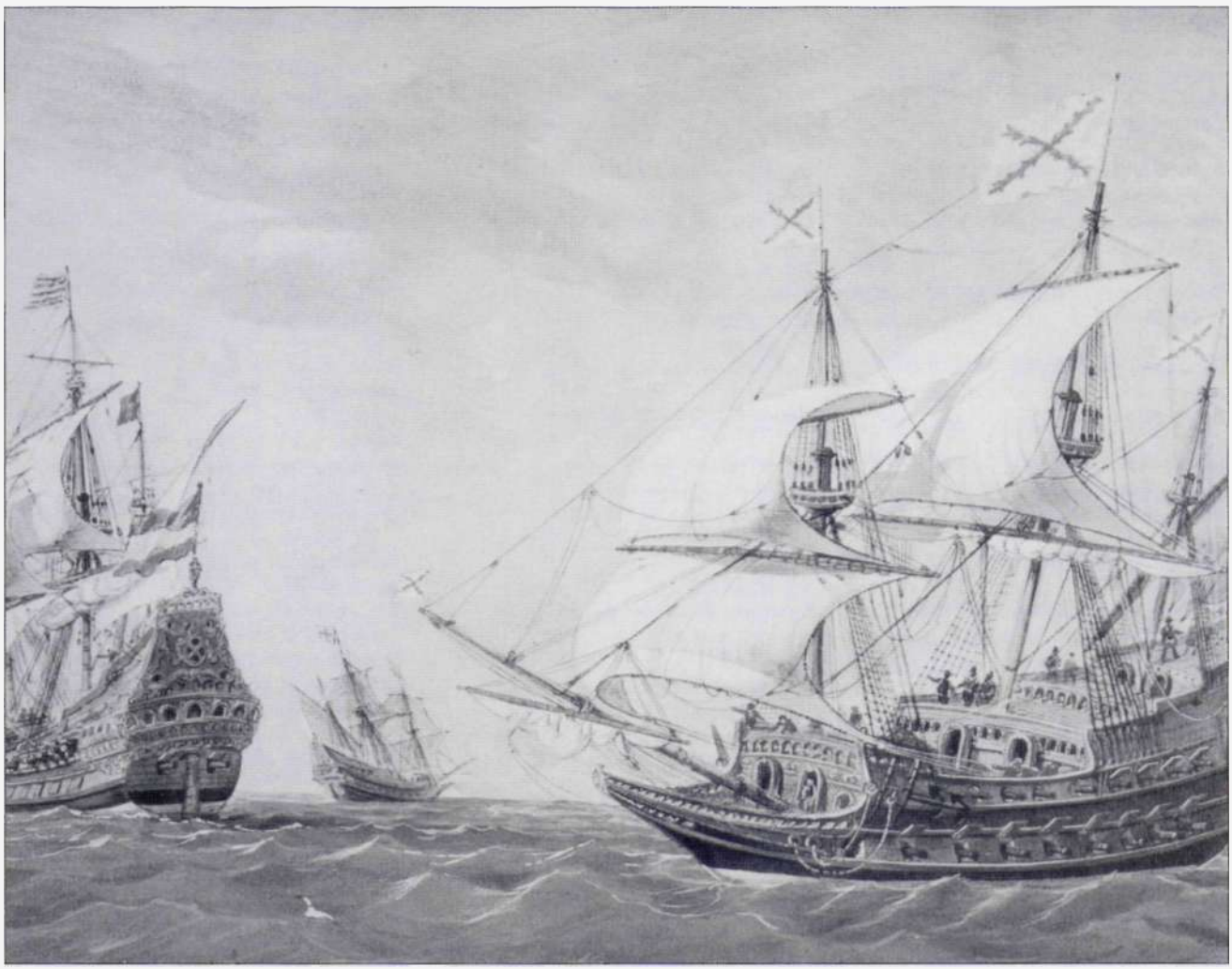
abandoned ship. Don Lope went down with the ship along with over 500 of the galleon's crew of 600 men. This plate shows the turning point of the engagement, when the Dutch launched their fireships out of the fog into the path of the Spanish capitana.

G: THE *NUESTRA SENORA DE LA PURA Y LIMPIA CONCEPCION,* 1641

One of the last true Spanish galleons, the *Nuestra Senora de la Conception* was built in Havana in 1620 as a nao, then refitted and converted into a galleon in 1639 after being hired by the *Casa de la Contratacidn* in 1639, for service as a guardship of the Indies flota. While the French and English gave their ships inspiring secular names such as *Victory* or *Triumph,* the Spanish continued to rely on more spiritual names, such as the name of a saint *(San* or *Santa,* depending on gender), or Our Lady (*Nuestra Senora*), usually of a certain church or episcopal see. 'Our Lady of the Conception' was a 600-tonelada galleon, measuring 140ft on her waterline, armed with 36 guns, and crewed by 250 soldiers and sailors. By the time of her conversion Spanish ship designers were starting to reduce the height of the sterncastle structure on their vessels, although these still remained higher than those on other European ships. The *Conception* therefore represents the final stage of galleon development as, from 1650 on, Spanish naval architects copied the design of contemporary French and even Dutch warships. This new generation of warships were true ships-of-the-line, with lower superstructures and heavier broadside batteries. The *Nuestra Senora de la Conception* continued to serve in the Indies flotas until she was lost in a hurricane off the island of Hispaniola (now the Dominican Republic) in 1641. During the late 17th century an English salvor located the wreck, and recovered much of her cargo of silver and gold.

The inset shows one of the newer cast-iron guns which were entering Spanish service during the mid-17th century. The *canon* (24-pounder) portrayed in the inset is based on one cast in the Lierganes foundry near Santander around 1637, which was subsequently lost in a shipwreck off the Bahamas in 1656. The piece is mounted on the type of four-wheeled carriage introduced into Spanish service during the 1630s and 1640s.

The pioneering research of Spanish naval historian Jose Monleon in the late 19th century did much to further our knowledge of the development of the Spanish galleon. Although not wholly accurate, this reconstruction by Monleon, produced in 1886, has formed the basis for most later depictions of the galleon. (Museo Naval, Madrid)



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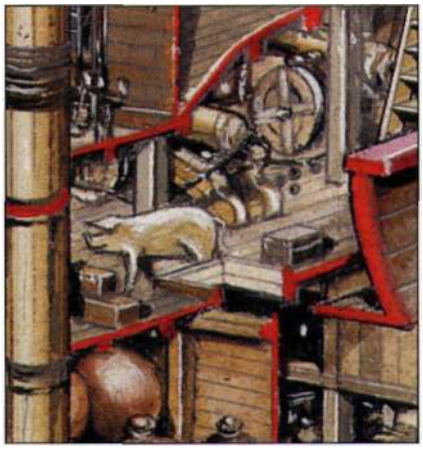

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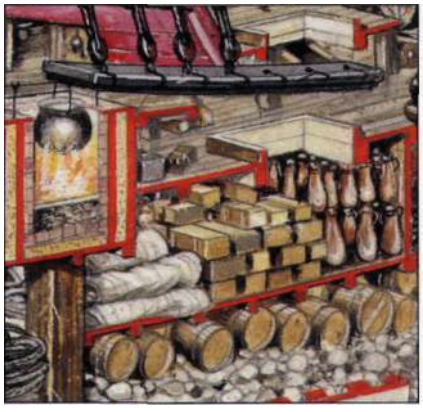

Cutaway artwork

Photographs

Spanish Galleon 1530-1690

During the middle decade of the 16th century a new type of sailing vessel emerged, designed to carry the wealth of the Americas to Spain. This was the galleon, and over the next century these vessels would serve Spain well as treasure ships and warships, becoming a symbol of Spanish power and wealth during the period. The development and construction of the Spanish galleon are discussed in this book, and the ordnance and crewing needed to produce and maintain these stately vessels are covered in detail. The author also examines the role of the galleon as a treasure ship, and describes how these ships were manned and fought in action.

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